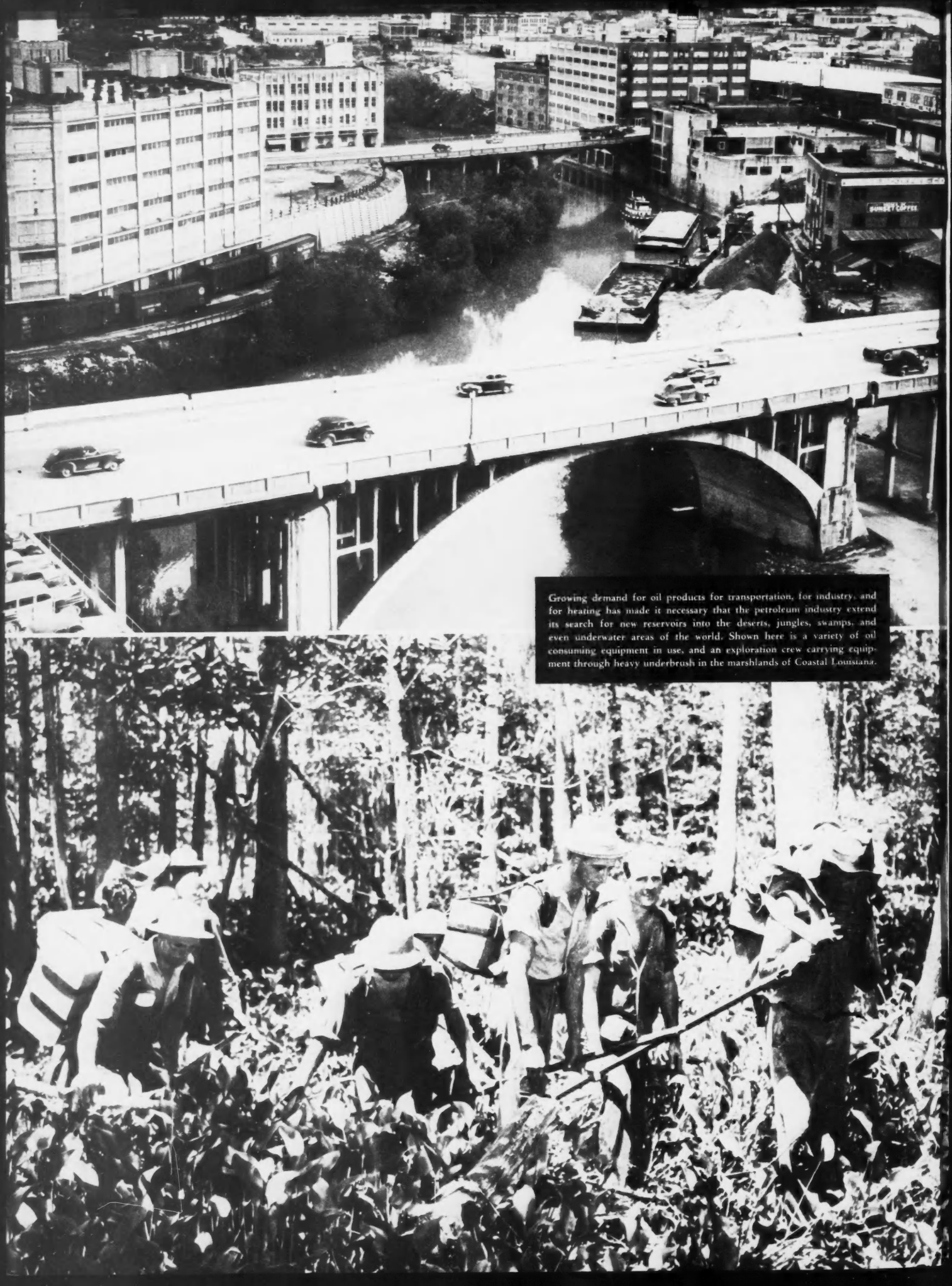
Drilling in Jungle Garden, La. *By E. M. Schiwetz*

The HUMBLE WAY

NOVEMBER-DECEMBER, 1947



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Vol. III NOVEMBER-DECEMBER 1947 No. 4

THE U.S. FUEL PROBLEM

Editor's Note: H. C. Wiess, President of Humble Oil & Refining Company, advanced some vigorous and thought-provoking ideas on the subject of national energy resources when he spoke on "Current Oil Developments" at the Houston Humble Club's annual banquet early in December. His treatment of a matter so important to the oil industry and to the nation deserves the widest possible coverage. The following adaptation of Mr. Wiess' speech was prepared for THE HUMBLE WAY.

THE demand for petroleum products threatens to outrun record supplies in the United States. That seems strange with record domestic production of nearly 2,000,000,000 barrels a year, which is twice as much as in 1935 and four times the amount in 1921. Such a record of achievement speaks eloquently for the superlative performance of the American petroleum industry in finding and developing oil under the stimulus of competition. By way of comparison, Russia's oil production is only about 10 per cent as much as that of the United States, even though its oil resources are probably far greater.

Difficulties currently being experienced in meeting all petroleum demands in the United States are not due to a shortage of oil. They arise because of an inordinate rate of growth in requirements and because of a world-wide fuel shortage resulting from a serious decline in European coal production. Demand for petroleum in the United States this year will be 10 per cent higher than a year ago and one-third greater than in 1941. By means of unusual efforts, the industry has been able to meet practically all demands this year and can meet a further gain of 6 per cent for 1948. If such supplies are not adequate, it is only because people are trying to use oil to replace coal and other fuels which are available and can be used.

The balancing of petroleum supply and demand can best be accomplished by (1) continuation of competitive exploration and development, and (2) by the operation of price differentials and normal economic forces to determine the relative use of such competing fuels as coal, oil, and gas.

Changes in Energy Production 1920-47

A major shift from coal to oil, amounting to a revolution in the use of energy resources, has occurred since 1920. The demand for petroleum products in the United States during the past 25 years has increased fourfold! On the other hand, during the past quarter century coal production has equaled the level of 1920 only in two years, 1944 and 1947. Coal's share of U. S. energy production declined from 80 per cent in 1920 to 48 per cent in 1947, while oil and gas production increased so rapidly that their share of U. S. energy production advanced from 16 per cent in 1920 to 48 per cent in 1947. In other words, oil and gas have supplied practically all of the increase in energy production in the past 25 years and now supply as much energy as coal.

The shift from coal to oil and gas reflects the success of the petroleum industry in supplying oil. The application of scientific methods enabled the industry to find large new reserves and to provide products at low prices. The relationship between oil and coal prices during this period was such as to make oil more attractive than coal. Cleanliness, convenience, and ease of automatic control for heating were other factors that encouraged the shift to oil. Government controls during World War II tended to accentuate the advantage of using oil rather than coal by keeping the price of oil low while permitting coal prices to rise. Consequently, there was a sharp upward surge in the civilian use of oil immediately following the end of World War II. Homeowners purchased large numbers of oil heaters, railroads ordered Diesel locomotives to replace coal-burning equipment, and other uses of petroleum products also expanded.

Looking Forward

The difficulties experienced within recent months in meeting the inordinate increases in demand for petroleum products have led to discussions in the press of "shortages." Such discussions are apt to be misleading, for the United States is not short of oil by any ordinary standards, as indicated by the great volume of current production. The United States will continue to have oil for a long time to come, although perhaps not in such large quantities as consumers would like to have.

Oil and gas are only two of the fuels available to consumers. Present supplies of these two fuels may be made to last longer by economy in use and may by supplemented by imports of oil, the use of more coal, and the manufacture of synthetic liquid fuels from coal and shales. Over a period of years, supply and demand for fuels will be balanced automatically by price differentials and the operation of normal economic forces unhampered by government interference.

A distinction should be made between the short-term and the long-term outlook for oil supplies. In the near future,

the limiting factor in supply will probably continue to be the availability of steel and other materials to overcome transportation and distribution difficulties and to drill more wells. Little help can be expected from synthetic fuels, because it takes years to make available substantial quantities by these methods. In the long run, alternate sources of supply can become important factors in satisfying the demand for liquid fuels.

There are undoubtedly many people who would like to know exactly how much oil remains to be found in the United States, when such oil will be found, and how much it will cost. Discovery of new oil is still unpredictable, despite many scientific techniques used in exploration. It would be extremely hazardous to venture predictions on this subject without pointing out the assumptions and limitations involved in any reply. The United States has experienced other periods in which demand for petroleum appeared to be outrunning supply, the most recent being as late as 1925. Past fears of shortage have quickly been overcome by large new discoveries. Now, however, demand has been built up to a much higher level and it is doubtful that new discoveries will again restore a surplus of productive oil capacity such as the United States became accustomed to in the period 1930-41.

Analysis of the alternatives for meeting future demands for liquid fuels will help provide an understanding of the fuel outlook and of the reasons why normal economic forces rather than artificial controls should be relied upon to provide necessary adjustments.

Alternate Sources of Liquid Fuels

Liquid fuels can be made available in the United States by several methods: (1) the discovery of new oil fields, (2) imports of oil from foreign countries, and (3) the manufacture of synthetic fuels from coal and gas. Reliance for domestic supplies in the past has been almost entirely on discoveries within the United States, as this nation has been a net exporter of oil for many years, only now reaching the point where imports equal exports.

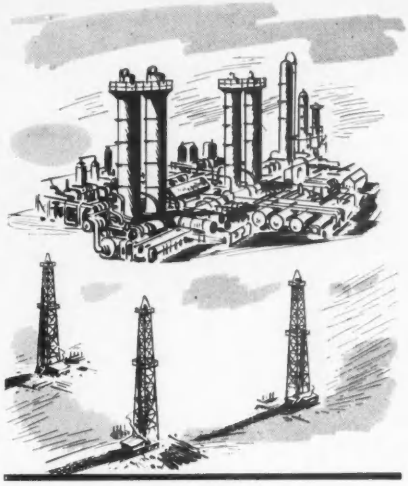
The industry is making extraordinary efforts and spending large sums of money to find and produce oil as fast as the nation is using it. More wells were drilled in 1947 than in any other year in the past quarter century. But finding 2,000,000,000 barrels a year is a large order because oil is becoming harder to find. Wells are being drilled deeper, and costs of developing and producing new oil are rising rapidly. The search for oil is being pushed to new areas such as the Southeastern States and the submerged lands near the coast. More oil will be found in the United States, but how much and how fast remains to be seen.

So long as demands were relatively small it was fairly simple for the petroleum industry to maintain a rate of exploration and discovery adequate to meet demands and even to increase reserves. But demands have increased for more than a quarter of a century at an average of more than 5 per cent per year, doubling every 15 years, to reach the present high level of 2,000,000,000 barrels annually. That exceeds the amount discovered in any except a few years in the entire history of the industry, presenting the industry with a problem of exploration and development that is staggering. Extraordinary efforts may enable the industry to maintain the present high rate of production over a considerable period of years, but it is not likely that production can double again in the next 15 years. Consequently, the time will come when the United States must look to additional imports or to synthesis from coal if much larger increases in requirements for liquid fuels are to be met.

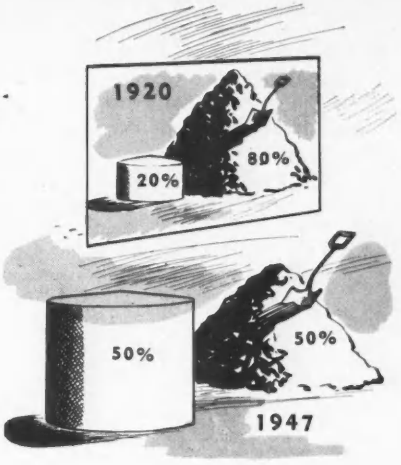
Imports will apparently supplement domestic production to an increasing extent for the future, if demand continues to increase as generally anticipated. Imports from Latin

OIL INDUSTRY GOES TO GREAT EFFORT AND EXPENSE TO FIND AND PRODUCE OIL AS FAST AS THE NATION USES IT

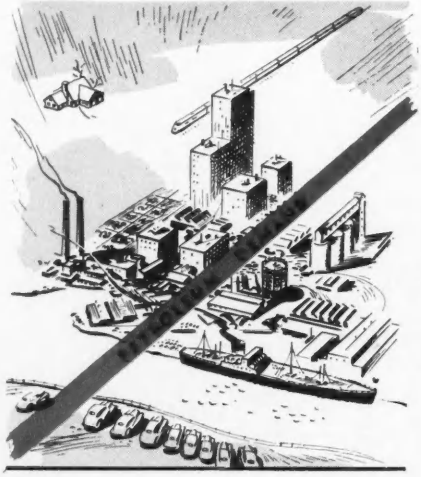
1. The basis of our high standard of living is energy to run machines, to drive all forms of transportation, and to provide heat. Oil and gas, coal, and water power are the main sources of energy to lighten our work, increase production, and make life enjoyable.



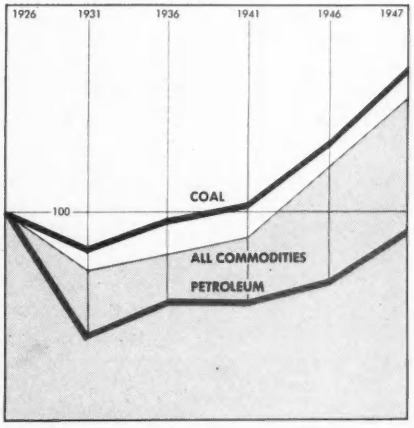
2. Oil and gas have supplied practically all of the increased demands for energy since 1920. The alert, progressive, efficient petroleum industry has done wonders in finding oil and gas and delivering petroleum products at low cost to meet rapidly growing demands.



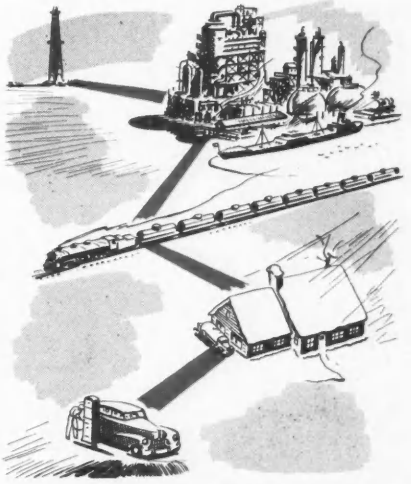
3. Oil and gas production has increased fourfold since 1920. Coal production is only now back to the 1920 level. Oil and gas now supply as much energy as coal in the U. S., although nature has endowed our nation more abundantly with coal than with petroleum.



4. The demand for petroleum this year will be ten per cent more than last year and one-third greater than in 1941. This increasing demand threatens to outrun record supplies by a small amount. Few other industries are doing as good a job of meeting demand.

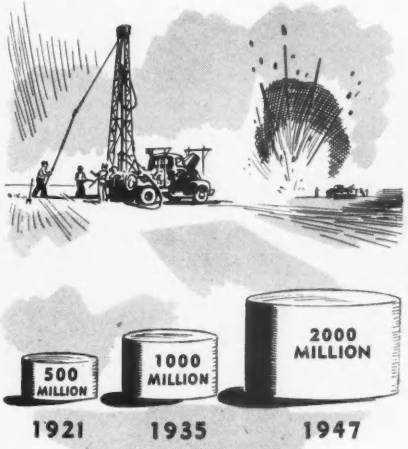


5. Petroleum products remain reasonably priced, and among the cheapest commodities consumers can buy even after recent increases caused by the higher cost of finding oil. Low cost, convenience, and dependability of petroleum products explain increased demand.



6. Steel is indispensable to producing, refining, and transporting petroleum. Shortage of steel since 1941 has delayed the normal expansion. Lack of transportation facilities is creating local distribution difficulties in spite of extraordinary efforts by the oil industry.

7. The U. S. oil industry will produce two billion barrels in 1947, or 600 gallons for every person in the U. S. Our oil consumption per capita is thirty times the average for the rest of the world, which again indicates the superb performance of the American oil industry.



8. The oil industry expects to find supplies for many years in the future by intensive search. But 2000 million barrels is a lot of oil to find annually in the U. S. Domestic oil production may no longer be able to meet all future growth in energy requirements.

9. Competition between petroleum and coal has benefited consumers. Both are needed to provide energy. Oil should not be blamed for failing to meet demands created by worldwide coal shortages. Continued competition is the best way to balance supply and demand.

America have supplemented production in this country in the past, and may become more important in the future. The United States has developed its oil resources more rapidly than the rest of the world; so, it is quite reasonable to think that as foreign reserves are explored and developed more thoroughly, substantial quantities of oil will become available for importation into the United States.

It is fortunate that the potential reserves of oil in the Western Hemisphere appear to be large, for those are the reserves most likely to be useful to the United States in case of an emergency. The oil reserves of the Middle East, rich and important as they may be for the world as a whole, probably will be only a marginal source of supply for the United States. Oil from this area will find its natural outlet in supplying needs in the Eastern Hemisphere, thereby reducing the drain on Western Hemisphere sources which can then furnish more oil for use in the United States. Strategic considerations suggest that the United States is not likely to count upon oil from the Middle East except for such marginal quantities as would not be needed in case of a national emergency.

Synthetic Fuels

Liquid fuels can be made from natural gas and coal if necessary. Techniques for making synthetic fuels are known and have been used successfully in some cases, but the synthetic fuels industry is still in the development stage. The huge investment and the time required for construction are the handicaps to immediate expansion of manufacture of synthetic liquid fuels.

The cost of liquid fuels made from natural gas is almost competitive with that of fuels from crude oil at the present time. But gas reserves are also limited, and there is a growing demand for gas in its natural form, which is so convenient for heating. Plans for two gas synthesis plants in the United States have been announced, but it will be several years before they are completed. Their capacity will be adequate to supply only about one-half of one per cent of the present demand for petroleum liquids. Economic considerations suggest that natural gas cannot be counted upon for any large additional volume of liquid synthetic fuels.

Liquid fuels can be made from coal and such processes were used in Germany during World War II; but with present techniques, the cost of these products is considerably above the price of gasoline refined from petroleum. Such processes are still in the pioneering stage, and costs may be reduced by future improvements in technology. Tremendous investments in new facilities would be necessary, however, and many years might elapse before large-scale manufacture of liquid fuels from coal could be realized. In the long-run, consumers can have coal converted to liquid products provided they are willing to pay the cost of such conversion as a premium for the advantages of using liquid fuels. The cost of conversion may be partially offset by transportation savings since it is cheaper to move gas and oil in large quantities than it is to move coal.

Balancing Fuel Requirements

The variety and quantity of energy resources is such that consumers can count upon having their fuel requirements satisfied. Principal available sources of energy are coal, oil, gas, and water power, with coal by far the most abundant. Although oil and gas now supply as much of the nation's energy requirements as coal, potential reserves of petroleum are, at most, only about 5 to 10 per cent as large as potential reserves of coal. Fortunately, coal can be converted into oil and gas, although the cost may be greater than if it is used directly as a fuel. Nuclear fission is another source of energy which may become available for public use in the future.

Efficient use of the less abundant fuels would help to make their advantages available for a longer period of time. Such economy can be encouraged by use of price differentials. In the case of oil, there is room for improved efficiency in the use of motor fuels which manufacturers will recognize if price becomes a significant factor to consumers. The relative use of the several fuels is, after all, a matter of economics depending upon cost and price. The availability of abundant supplies of oil and gas at low prices explains why their demand has increased so rapidly. Whatever the course of oil and gas discoveries for the future, supply and demand forces will tend to bring about a balance, unless hampered by government interference.

The significance of the variety and quantity of fuels available is that sufficient energy will continue to be available for the needs of an industrial, mechanized economy and for high standards of living in the modern world. During the nineteenth century, coal laid the foundation for industrial progress. In the early part of the twentieth century, oil and gas have played a major part in the economic progress of the United States. In the future, atomic energy could easily become a major source of energy to facilitate production and progress.

It is entirely possible that the United States is entering a period in which the cost and price of oil and gas may be higher in relation to coal than during the past 25 years. In that case, the pendulum may swing back toward a greater relative use of coal, either directly or as a raw material for synthetic fuels. Prices must necessarily reflect changing costs and necessary differentials to balance the supply and demand for the various fuels. Artificial interference with normal economic price adjustments can only work to the detriment of consumers and of the nation in the long run. Reliance upon the same vigorous competition between fuels that has existed in the past will provide the best opportunity for consumers to secure their energy requirements in the form they want at the lowest cost.

Conclusion

Present conditions create concern over the future supply of liquid fuels. Immediate developments should be viewed in terms of trends over a period of time and the availability of alternate fuels. Some conclusions suggested by the above analysis of the situation are set forth below:

1. The oil industry is now supplying record quantities of petroleum, but the world is still short of fuel, as a result of the decline in European coal production.
2. An important reason for today's tight oil supply situation in the U. S. is the extraordinary increase in demand for oil products.
3. The tremendous increase in U. S. demand for petroleum products during the past 25 years represents a major shift from coal to oil and gas.
4. Oil and gas have supplied practically all of the increase in energy produced in the U. S. since 1920, and now supply as much energy as coal.
5. In the long run, imports and synthetic fuels can become important factors in satisfying the demand for liquid fuels.
6. Normal economic forces should be relied upon to balance demand and supply for the various fuels available to consumers.

AS OIL IS SOUGHT IN MORE DIFFICULT AREAS, EXPENSIVE FACILITIES ARE REQUIRED TO TAP DEEPER HORIZONS

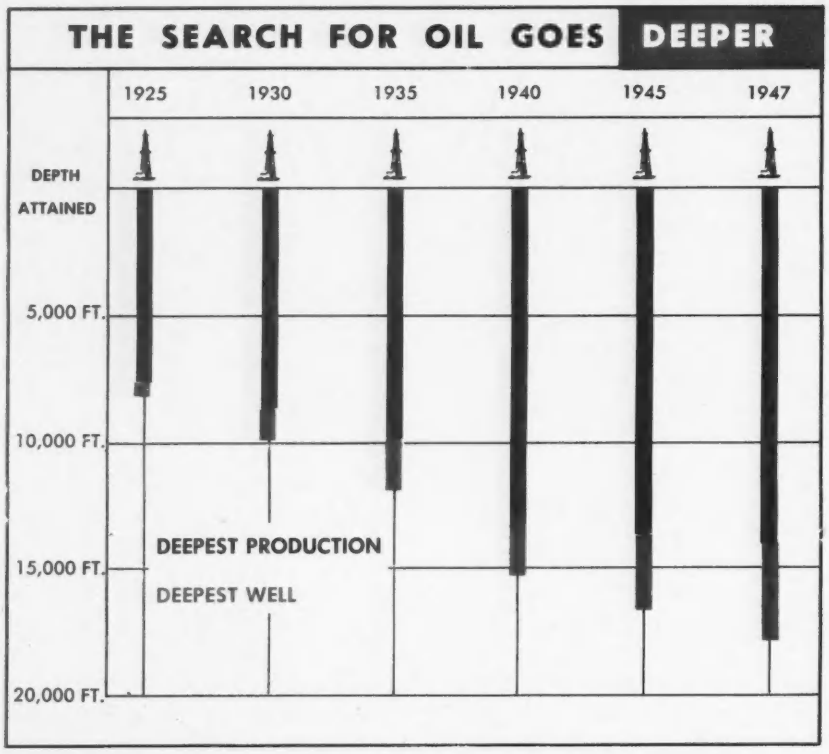
Deeper and Costlier

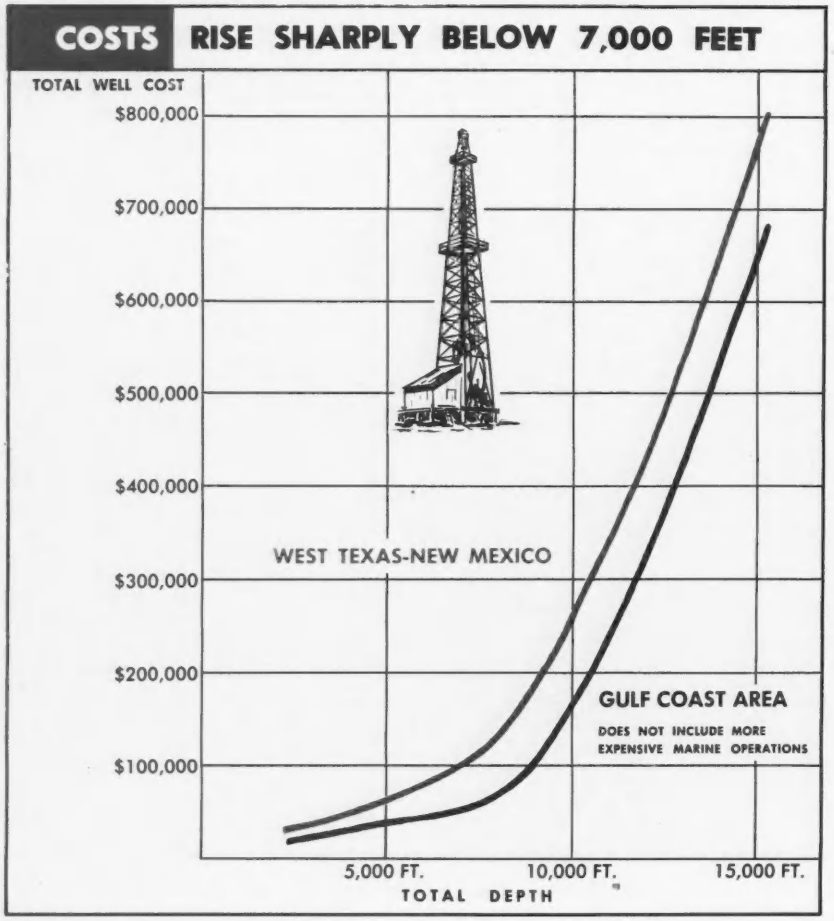
"All the easy oil has been found" is the observation of many people in the oil business who are concerned with the search for and the development of oil reserves for tomorrow. This statement is echoed down the line from those who plan the exploratory surveys and the drilling crews who put down the wells to the production crews who handle them afterward. Today, faced with an unprecedented demand for petroleum products, the oil industry is pressing for still more production to maintain the reserves which are being so heavily drawn upon.

To find oil as fast as it is being produced and consumed is the present problem, and the oil industry, by extensive exploratory operations, is searching new and old areas to greater depths. Interest is currently centered upon the prospects of finding oil on the continental shelf and on finding more oil under the shallow coastal waters. Proof of all exploration lies in the wildcat well drilled to discover the new oil, and almost everywhere drillers are going deeper in search of new productive zones, often drilling less favorable class B and C prospects not drilled when oil was easier to find.

MILES OF DRILL PIPE standing in derrick symbolize today's deeper drilling activities.

The wildcat or "discovery" well usually costs almost twice as much as the second and succeeding wells in a field. This is due to the greater amount of coring and survey work required, and delay born of caution necessary when little is known about formations peculiar to that field. The difference in the cost of wildcat and field wells becomes less and less as the field producing horizons go deeper; yet more of the deep, expensive wildcats are dry holes. Dry holes are not complete losses as is popularly believed; generally, valuable geologic data are obtained, and often there is sufficient show of oil to point to fu-





ture more successful operations. Nine of every ten wildcats drilled in the past 10 years were dry, but the discovery of a large percentage of the nation's major reservoirs has followed one or more disappointing dry holes.

The difficulties of finding more oil are reflected in greater costs, despite the great strides made in improving drilling and exploration efficiency. Today a 10,000 foot well still costs about three times as much as a 7,000 foot well, and a 15,000 foot well is nearly 12 times as expensive. A well may be drilled to 7,000 feet for approximately $10 per foot, but the cost skyrockets to almost $100 for each foot below the 10,000 mark.

Why this higher cost of deep drilling?

The biggest single factor affecting drilling cost is time. Total cost and total time on a well are roughly proportional to depth down to about 7,000 feet, below which both soar upward. Time affects cost because most items of expense of drilling a well are related to time, and amount to a daily operating expense of approximately $1,000 per day on a deep-drilling rig. More time on location is reflected on the cost sheet in many ways, but primarily in labor and equipment rental costs. Not only does extra time involve more fuel and supplies, but repair and maintenance costs rise due to the heavier tasks performed in hoisting and rotating the drill string, and circulating the drilling mud.

Harder Formations Slow Progress

Unless abnormally hard formations are encountered, as in West and North Texas, drilling speed is fairly constant down to 7,000 feet, but "making hole" below that depth becomes progressively more difficult, and is the major cause for the increased time required to drill a deep well. Studies have shown that drilling speed decreases 40 per cent from 8,000 to 9,000 feet, and even more as the bit bores farther down. Many times an entire eight hour tour is required to drill but one foot, so hard are some of the deeper strata. Formations of older geologic strata which are often buried at great depths are usually harder than material deposited in more recent geologic time.

The time to make round trips to change bits and make surveys doesn't have an appreciable effect upon drilling progress until the bit goes below 10,000 feet, when the number of trips as well as their greater length combine to add to the drilling time.

Harder formations decrease bit footage, and more coring requires extra trips.

Drilling speed is further retarded by the reduced rate of drilling mud circulation as the drill stem lengthens. Horsepower limitations of the big mud pumps cause reduction of mud velocity as the pressure is raised to combat fluid friction in the four mile and more trip through the mud system.

Wear on the big mud pumps and mud lines is more rapid due to the higher pressures demanded in deep drilling. The higher temperature and heavier weight of the drilling mud also decrease the life of pump parts, imposing extra hardships on the mud system and making continuous operation difficult, even when several pumps are used.

Yet another reason for the slower drilling progress below 7,000 feet lies in the greater caution which must be exercised. Because a drill string more than two miles long is quite elastic, accurate control is difficult, and the driller loses some of the "feel" of the bit as it bores farther and farther from him. With each foot of depth the risk of twisting off the drill pipe or sticking it is increased, and most drillers reduce the speed of rotation and weight on the bit to forestall such hazards.

Probing in the dark with a finger of steel more than 10,000 feet long is difficult at best, and many deep holes are fraught with added trouble in the form of twisted-off or stuck drill pipe, lost circulation, or other hazards, in spite of the caution observed. Unforeseen mishaps such as these often add many expensive days, and sometimes make further drilling uneconomical.

Mud, Casing Expensive

The major hazard of deep drilling in the coastal area lies in the abnormally high pressures which are likely to be encountered. Weighting material must be added to the drilling mud to forestall a "blow-out," in turn increasing the dangers of losing the mud to a porous formation. Costs pyramid when the heavier mud requires expensive chemical treatment to maintain proper characteristics for efficient drilling. The magnitude of these problems can be grasped from the fact that drilling mud treatment on some wells costs as much as $100,000.

Casing, one of the most critical items of supply in the oil fields today, is another major item of cost in drilling a deep well. Quite often the cost of casing exceeds one-fifth of the total well cost, especially where a protective string is set between 7500 and 9500 feet. The heavier pipe required for extra long strings means extra expense. Hand-in-glove with casing expense is the cost of cementing and cement, which is considerable with some deep wells.

The expense of preparing the location and providing a firm footing for the derrick is substantial in the cost of a deep well. Heavy-duty roads and bridges, often constructed over difficult terrain, are required for deep-drilling equipment. These, of course, contribute to the increased costs of deep wells. Transportation costs are higher, too, due to the greater weight and bulk of an extra-heavy rig and its supplies.

Tomorrow's Oil More Expensive

In the great boom days in East Texas oil was cheaply and easily found, an oil well often costing as little as $10,000. Unfortunately, there was only one East Texas with its thick oil sand lying only 3,700 feet below the surface. The fields found today are far less productive, and harder to operate. As the shallow oil is consumed, the industry must turn to the deeper reservoirs, the high cost of which is emphasized by the fact that a 12,000 foot well today costs almost 40 times as much as the earlier East Texas wells.

All these extra costs serve to illustrate plainly why tomorrow's oil will be more expensive, as the "easy oil" found in the past is consumed, and production from these deeper, costlier fields must be relied upon. However, we may be confident that further reductions in the cost of drilling deep wells will be made. As more deep holes are drilled, the experience is reflected in savings on subsequent wells drilled, and in the design of new, improved equipment. The oil industry and its suppliers are constantly seeking cheaper and better methods of drilling for and producing the oil which is so important to our everyday life and future, and real progress is being made. To date, the deepest production is near 14,000 feet, but the search for deeper oil continues, and the day of the 20,000 foot well may not be too far in the future.

The oil industry is meeting the challenge it faces with all the vigor and energy for which it has always been known, and will press the search for more oil out into the waters of the continental shelf and into new and difficult areas everywhere. In the light of today's facts, tomorrow's oil, sought through the coming years, will no doubt be more expensive oil.

WEIGHTING MATERIAL must be added to drilling mud to control abnormal pressures often encountered in deep wells. Chemical treatment also adds to the mud costs of many deep wells.

WONDER *Island*

Salt plug in Louisiana marshes is home of botanical gardens and bird sanctuary; of substantial salt, petroleum, pepper sauce industries

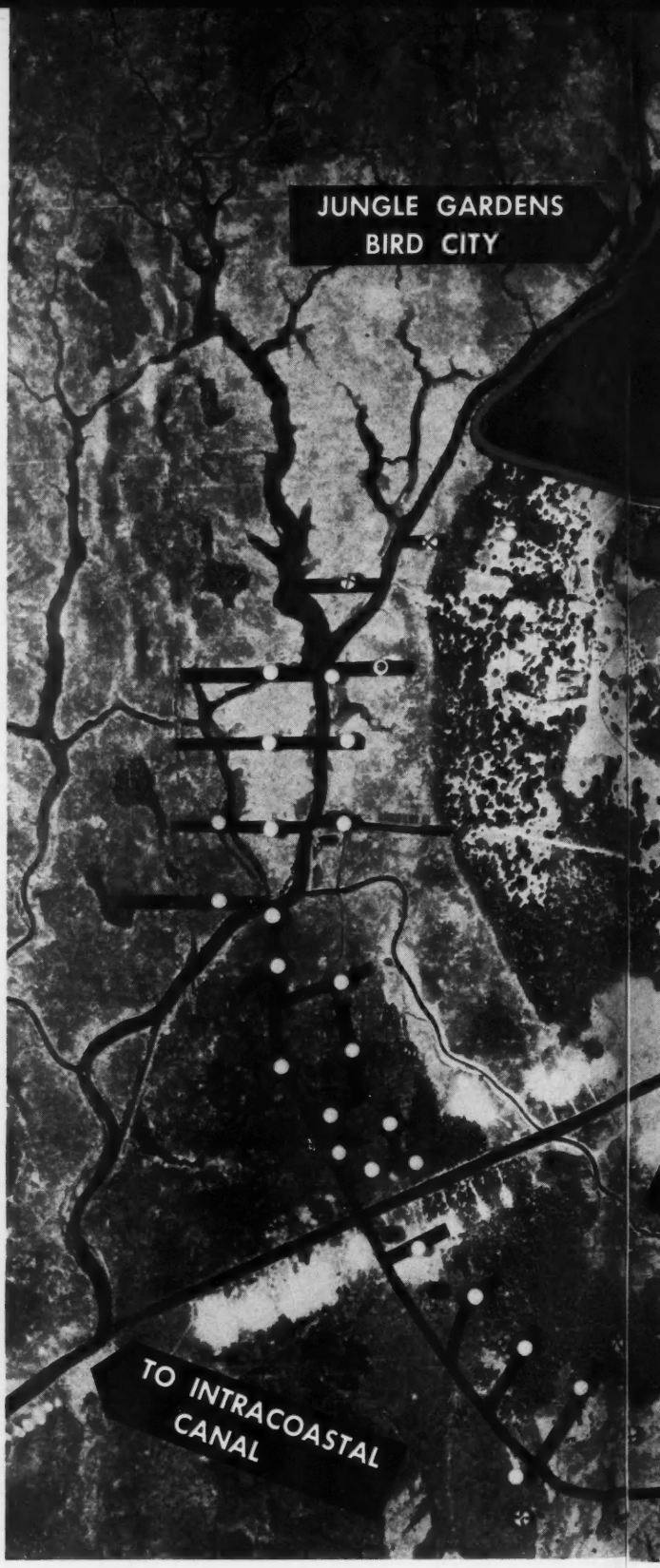
AMONG the many interesting and surprising phenomena to be found along the half-moon sweep of Louisiana's coastline there is a unique group of five "islands"—Jefferson, Avery, Weeks, Cote Blanche, and Belle Isle. Their uniqueness stems from the fact that they are not islands at all in the sense that school children learn the meaning of the word in geography class. None of them is "a tract of land surrounded by water"; rather each may be described more accurately as a bump on the monotonous face of the level marshlands, a hill pushed up out of the endless flat reaches.

Intriguing indeed is the scientific explanation for the presence of these "islands." Geologists explain that in an ancient geologic age the coastal area was overlain by a desiccating, or gradually drying up, sea. At the conclusion of the drying up period an enormous deposit of salt was left behind. Through succeeding geologic ages the winds and rivers heaped great alluvial deposits of soil on top of the salt bed so that now the salt bed is some five or six miles below the surface. These overlying beds exerted extreme pressure upon the salt and caused it to become somewhat plastic. In this state the salt broke through overlying strata and was forced upward, forming enormous underground domes of various shapes and sizes. A large number of these domes along the coasts of Texas, Louisiana, and Mississippi have been located by prospectors in drilling wells. Most of these salt domes are found at considerable depths below the surface, but the Louisiana chain of five is particularly interesting because at these places the salt has intruded so near the surface that the pronounced rises or hills, known as islands, have been found in the marshes.

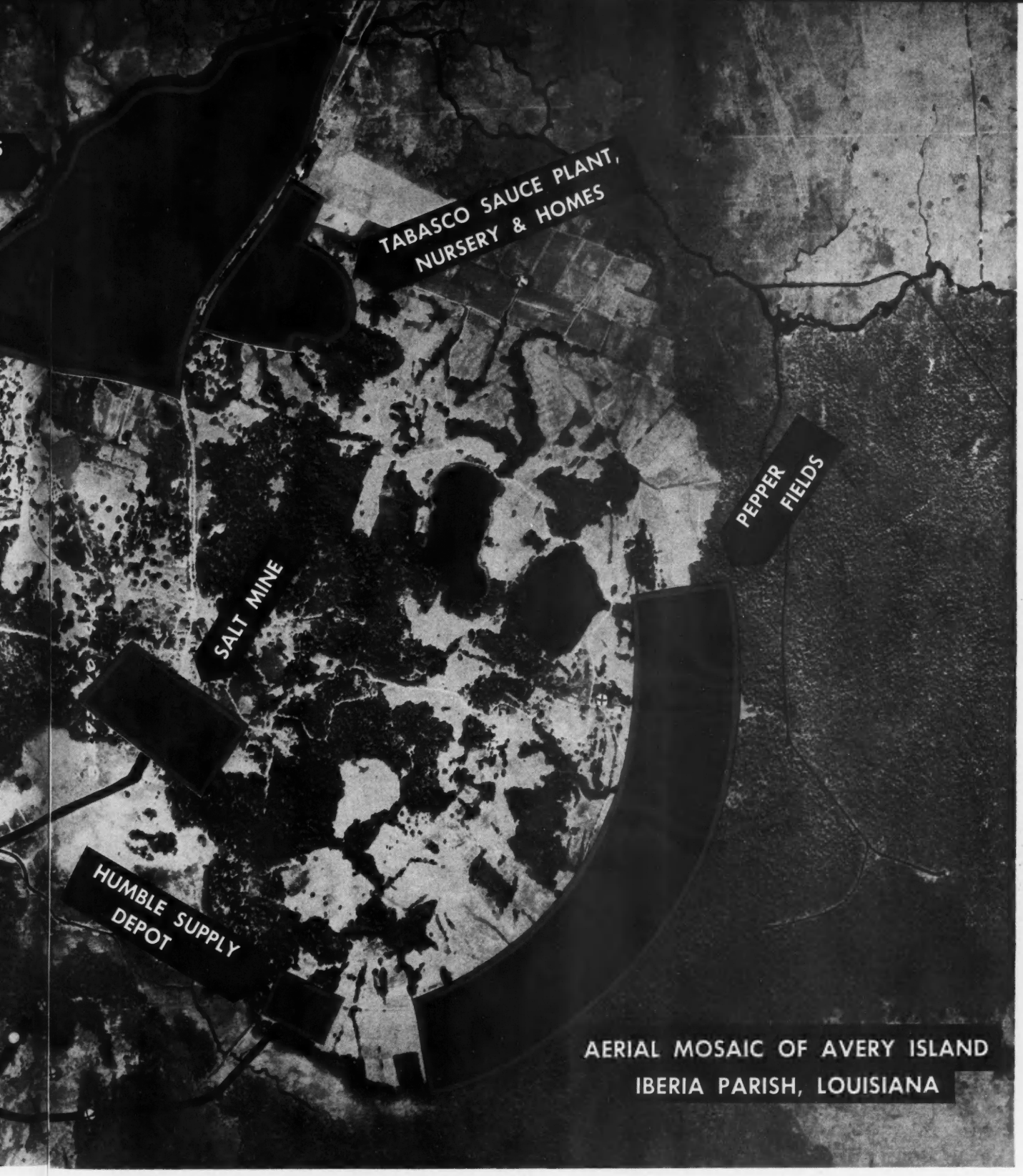
Avery Island has Personality

Of the five, Avery Island is truly the wonder island. It is located in Iberia Parish, some 10 miles southwest of the town of New Iberia. Roughly oval in shape, it is about two and one-half miles long and one and three-fourths wide, with the axis running north and south. Its maximum elevation is 181 feet, and near the top there are two enchanting lakes whose shores are adorned by clumps of bearded oaks. Standing up out of the reed-grown tide marshes in all its verdant majesty, Avery Island appears to hold regal sway over an area as far as the eye can see. Bayou *Petit Anse* meanders around one-half of the island and has been deepened to serve as a connecting link with the Intracoastal Canal a few miles away.

Avery Island, above all others in the chain, possesses a fascinating personality. Its leading inhabitant, world traveler, explorer, naturalist, writer Edward Avery McIlhenny, direct descendant of the original grantee to the island, has devoted the major portion of his very active life to developing that personality.



Mr. McIlhenny was born on the island and spent his boyhood on the jungle-like hill surrounded by watery marsh. In his early manhood he left home and school to taste the



AERIAL MOSAIC shows how Avery Island protrudes out of the marshes. Colored areas point up how much of the small island's area is devoted to industry and beauty spots. In oil field at left, white pegs denote producing wells; crossed, dry holes; and dotted, drilling wells.

excitement of travel—as a member of Arctic expeditions, world tours, and big game hunts. Some 50 years ago he returned to his birthplace and began developing a portion of the island into a paradise of flowering grandeur. He has literally brought beauty from the far corners of the world to his doorstep through a myriad of shrubs and plants from

WONDER *Island*

Salt plug in Louisiana marshes is home of botanical gardens and bird sanctuary; of substantial salt, petroleum, pepper sauce industries

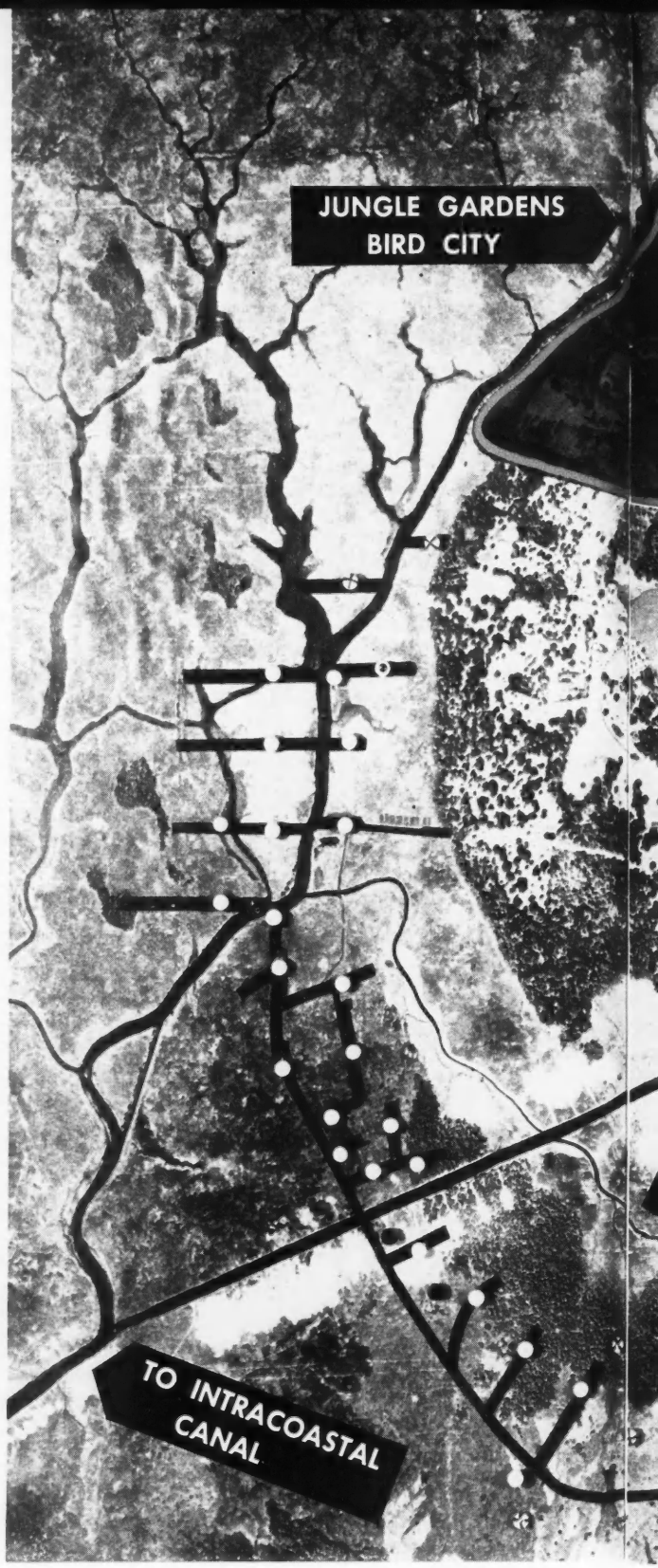
AMONG the many interesting and surprising phenomena to be found along the half-moon sweep of Louisiana's coastline there is a unique group of five "islands"—Jefferson, Avery, Weeks, Cote Blanche, and Belle Isle. Their uniqueness stems from the fact that they are not islands at all in the sense that school children learn the meaning of the word in geography class. None of them is "a tract of land surrounded by water"; rather each may be described more accurately as a bump on the monotonous face of the level marshlands, a hill-pushed up out of the endless flat reaches.

Intriguing indeed is the scientific explanation for the presence of these "islands." Geologists explain that in an ancient geologic age the coastal area was overlain by a desiccating, or gradually drying up, sea. At the conclusion of the drying up period an enormous deposit of salt was left behind. Through succeeding geologic ages the winds and rivers heaped great alluvial deposits of soil on top of the salt bed so that now the salt bed is some five or six miles below the surface. These overlying beds exerted extreme pressure upon the salt and caused it to become somewhat plastic. In this state the salt broke through overlying strata and was forced upward, forming enormous underground domes of various shapes and sizes. A large number of these domes along the coasts of Texas, Louisiana, and Mississippi have been located by prospectors in drilling wells. Most of these salt domes are found at considerable depths below the surface, but the Louisiana chain of five is particularly interesting because at these places the salt has intruded so near the surface that the pronounced rises or hills, known as islands, have been found in the marshes.

Avery Island has Personality

Of the five, Avery Island is truly the wonder island. It is located in Iberia Parish, some 10 miles southwest of the town of New Iberia. Roughly oval in shape, it is about two and one-half miles long and one and three-fourths wide, with the axis running north and south. Its maximum elevation is 181 feet, and near the top there are two enchanting lakes whose shores are adorned by clumps of bearded oaks. Standing up out of the reed-grown tide marshes in all its verdant majesty, Avery Island appears to hold regal sway over an area as far as the eye can see. Bayou *Petit Anse* meanders around one-half of the island and has been deepened to serve as a connecting link with the Intracoastal Canal a few miles away.

Avery Island, above all others in the chain, possesses a fascinating personality. Its leading inhabitant, world traveler, explorer, naturalist, writer Edward Avery McIlhenny, direct descendant of the original grantee to the island, has devoted the major portion of his very active life to developing that personality.



Mr. McIlhenny was born on the island and spent his boyhood on the jungle-like hill surrounded by watery marsh. In his early manhood he left home and school to taste the

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foreign lands which make of his Jungle Gardens a *pot-pourri* of vegetation and blooming splendor that is at once profuse and orderly. He has not been content, however, merely to plan and to cultivate an exotic 200-acre garden spot; he has also established a large bird sanctuary, and has directed and watched industrial development of considerable magnitude take place on the island.

Salt Spring Discovered

An adequate comprehension of this variety of activities demands a brief tracing of the island's history. Documentary evidence dates the first white man's presence on the island in 1789. The widow and five children of Mr. John Hayes, trapper and fisherman who died two years earlier in New Orelans, settled on the island after having roamed the uninhabited coast westward from the Crescent city. They built a palm leaf covered cabin and lived off the bountiful supply of fish and game. It was in 1791 that the eldest son, John Jr., discovered, quite by accident while hunting deer, a salt spring on the south side of the island. This spring later led to the discovery that solid rock was only about 13 feet beneath the surface.

Two years after the arrival of the Hayes family, John C. Marsh of New Orleans gained possession, under a Spanish grant, of most of the high land and some of the low land surrounding Avery Island. During the War of 1812 the price of salt went up and John Marsh built and operated a salt evaporating plant on the site of the salt spring. The plant was soon abandoned again when salt was shipped in from foreign lands cheaper than the Avery Island works could produce it.

Not until the outbreak of the Civil War were the salt springs utilized again. Then it was Judge Daniel D. Avery, son-in-law of Mr. Marsh, who set up an elaborate evaporating plant on the island to supply the Confederate states and army. He permitted a number of southern states to set up their own salt works and provided salt free from his own plant to the Confederate Government. When this heavy drain began to overtax the salt springs, Judge Avery's young son, John, undertook to manage the deepening of the brine wells. When workmen carried the shaft down to 13 feet they announced the discovery of a rock which appeared to extend across the entire floor of the well. Young Avery sent down a chisel and hammer and asked that a sample of rock be obtained. What was brought up proved to be the first rock salt found on the western hemisphere; and here soon was established the hemisphere's first rock salt mine.

In April of the following year the Federal forces under General Banks captured the mine and burned all of the open pit workings except those needed to fill their own wants. Following the war the salt deposit was leased successively to several companies who operated plants with varying degrees of success. The Avery Island Rock Salt Mining Company was organized in 1898, but a year later the mine was leased to International Salt Company. A new shaft was sunk to 500 feet that year, and International has worked the mine through the shaft continuously since that time.

A tour of the mine reveals the comparative simplicity of modern salt mining methods and techniques. Speeding downward in a dark elevator one is gripped with the sensation of going much deeper into the bowels of the earth than is actually the case. Once in the mine, the scene is somewhat amazing. This man-made cavern compares favorably with some of America's leading natural caves which annually attract thousands of sight-seeing visitors; only here one sees the handiwork of man and nature, rather than that of nature alone. With nothing but salt under foot and salt above and on all sides, one can scarcely help but be reminded of the Biblical story in which Lot's wife was turned to a pillar of salt when she chose to disobey and look back upon the destruction of Sodom and Gomorrah.

Millions of Tons of Salt

In all directions high-domed avenues, carved like cathedral naves, give evidence that millions of tons of salt have been removed from these workings. At the end of one of these cavernous cuts two men stand on high ladders directing noisy electric drills into the solid face of salt. "Drilling holes for explosives," the guide comments. From behind there comes a strange drone which proves to be the sound of a small electric train of cars loaded with rock salt. Down still another corridor all is quiet. Lights blink and the guide asks that all stand still; a shot is about to be set off. Like the grip of a hurricane, the blast makes clothing cling fast to the body; and as the sound of the explosion reverberates from wall to wall the momentary feeling of fear is replaced by one of security. The salt mass overhead is solid; as, indeed, are the 75-foot columns left by the mine operators to give strength. The heap of some 25 tons of salt blasted loose will

MIRROR POOL and leaning oak are among the many unusual features which make Jungle Gardens a series of never-ending surprises to visitors.

AZALEAS BLOOM in profusion in every court and along every drive; among some 30,000 plants in the gardens there are over 100 varieties.

be loaded by an electric crane and carried by the little train to the elevators for transportation up to the crushers.

Back in the light of day the guide explains that the rock salt is 99.5 per cent pure and needs only to be crushed to the several sizes for home and commercial use and put in boxes or sacks to be made ready for shipment.

As if directed by a recipe in a cook book, the next stop is at the Tabasco hot sauce plant, a vine covered structure, in a grove of trees. Behind this plant and the world market which it serves there is an interesting story.

Pepper Seeds from Mexico

It seems that a soldier and former McIlhenny retainer by the name of Gleason, who had remained in Mexico for a few years after the war between the United States and Mexico, returned to the states in 1852 and presented to the present Mr. McIlhenny's father a packet of pepper seed from the state of Tabasco. Both Judge Avery and the elder McIlhenny being lovers of highly seasoned food, planted the seeds and soon began to experiment with condiments made from the flavorful hot peppers. The pungent hot sauce which resulted found favor with friends.

After the War Between the States when the two families returned to their island home and began the task of rebuilding their fortunes they thought first of the hot sauce. The name Tabasco was copyrighted and the hot sauce was placed on the market. Its widespread acceptance today is evidence of the wisdom of the move.

Today, pepper growing and processing is one of the island's important industries. In the fertile fields which slope down the eastern side of the island the prolific pepper plants are grown. In the fall when the fields are brilliant with color of ripening fruit, great throngs of pickers gather the flaming red pods. At the plant the peppers are macerated by machines and the resulting mash is packed in oak barrels. Small holes are then drilled in the barrel heads. Over these, to form a seal, is spread a layer of salt through which fermentation gases escape without allowing air to enter. When the ageing process is completed after some four years, vinegar is added to the mash and the mixture is again allowed to stand for a specified time. Then it is drawn off, filtered, and bottled in a modern, production-line unit which one would scarcely expect to find in a bowered hideaway such as is the plant on Avery Island.

But unexpected sights become the order of the day for the visitor to the island. While he drives along the road looking at the colorful pepper fields he comes upon a busy industrial site covering several acres. Here suddenly he finds himself looking at great stacks of pipe, neat rows of valves and drilling bits, and a variety of heavy oil field machinery. Out in the canal which runs right up to this storage terminal a speed boat roars away from the boat house and a chugging tug churns the dark water as it brings an awkward barge alongside the loading dock. This is Humble Oil & Refining Company's supply terminal for its operations in the Avery Island oil field.

First Tests 50 Years Ago

Oil development, like salt mining, pepper sauce manufacture, and other Avery Island activities, has an interesting and somewhat drawn out historical background.

As early as 1898 several unsuccessful shallow wells were drilled on the crest of the island. First efforts to explore the flanks of the salt dome came in 1928 when an independent

SNOWY EGRET MOTHER and her young huddle in feathery beauty; thousands of various families of water birds nest in Bird City annually.

company drilled holes to 5,500 and 5,800 feet without finding oil sand or reaching salt.

A significant flank test was made by one major oil company in 1939 with the sinking of a deep well to 11,155 feet on the eastern side of the island. The effort was to test sands against the salt face, but no dome material or salt were encountered, nor was there found a single formation bearing oil or gas. A short time later still another major company drilled a well almost 1,000 feet deeper near the site of the first test. This, too, was unsuccessful and the same company later sank another well to a depth of 11,237 feet on the southwestern edge of the dome without finding pay.

It was in January, 1942, that Humble Oil & Refining Company acquired the lease on Avery Island and on some surrounding acreage. Soon thereafter the Company spudded its first test some distance northeast from the last dry hole drilled by the previous operator. The drilling bit found salt at about 6,000 feet and the well was abandoned. A second location was staked 500 feet to the southwest. This well was drilled to 9,242 feet and was brought in as a producer on August 1, 1942, running 288 barrels of oil a day on initial test.

Since that time the Humble Company has drilled 26 more wells in the field, 19 of which are producing from several substantial sands in the reservoir. The field has been developed in a northwesterly direction so that today it skirts the entire western side of the island.

Since the field is located in the marshes just on the fringe of the uplift, all wells but one to date have been drilled from

big submergible barge rigs. These floating platforms are towed in via the Intracoastal Canal, up deepened Bayou *Petit Anse*, and thence into canals dredged right up to the island's sloping face.

Oil Field Fits into Pattern

So orderly and neatly has this substantial oil field been fitted into the existing pattern of criss-crossing bayous and channels that the visitor who has not been forewarned might well pass down *Petit Anse* bayou and scarcely realize that he is in an oil field. Off the main waterway there are a number of fingerlet channels, and in each of these stand one or two Christmas trees surrounded by small protective guard rails. Nothing more is visible to indicate that here is an oil field which in its short five-year life has produced more than four million barrels and is daily contributing in excess of 4,500 barrels to that growing stream required to meet today's high demand.

All production from 19 wells flow to two tank batteries on the island. The first is fitted neatly into the side of the island behind the supply yard. The other, a multiple set of tanks and separators, is located so unobtrusively in a grove of twisted, mossy oaks on the western side of the island as to be easily overlooked by anyone but a keen observer.

One of two wells currently being drilled, an outpost test, is Humble's first dry land location. It is set in a small clearing right in the heart of luxurious Jungle Gardens. Within a stone's throw of the Chinese Garden and Temple of Buddha, the well is drilling below 11,000 feet. Giant oaks surrounding the location almost dipped their gray beards into the mud pits, and the echo of the rig's grinding noises reverberated through the living tunnels of wisteria vines and thick forests of Chinese timber bamboo nearby.

From the well site it is but a short distance to camellia gardens which include some 600 varieties. Among the 30,000 or more azaleas in the Gardens there is a great variety of strains and colors, too. Ferns, palms, banana trees and rubber trees from remote corners of the world; lotus and papyrus trees from the Upper Nile; soap trees and muti-colored myrtles from India—all these and many more ambassadors are represented in Avery Island's botanical world court. Nor are they scattered about at random; rather they give evidence that Mr. McIlhenny is a master designer, a close student of arrangement and color balance.

Rare Wasi Orange Tree

Among the rarest of plants in the Gardens is the single Wasi orange tree, the only one known outside of the Emperor's gardens in Japan. How this one found its way into Mr. McIlhenny's possession is dramatically told in some of the literature presented to visitors. In Japan the fruit of the Wasi tree is sacred, the story goes, and no one but the Emperor may taste it. Many years ago, during his arctic expedition, Mr. McIlhenny rescued the crews of several wrecked Japanese whaling ships. The Japanese government sought to reward him with a decoration and then with a gift of money, both of which he refused. When asked officially to name what might be a suitable token of appreciation he asked for the rare orange tree, long sought by botanical gardens the world over. In due course the single sapling arrived at Avery Island, personally escorted by the chief pomologist of the federal Department of Agriculture.

A man of many significant accomplishments, M'sieu Ned, as Mr. McIlhenny is known among his employees and friends in the lower Louisiana country, counts Bird City among his leading ones. Away back in 1892 he became conscious of the fact that egrets were doomed to become museum pieces if the slaughter, then going on to procure plumes for women's hats, were not stopped. Egrets and other water birds which long had found haven in Louisiana's marshlands were being killed or frightened away, and Mr. McIlhenny was not happy with the prospects. He sought legislation to protect the birds, and to supplement his verbal and written pleas he decided to build a sanctuary where the birds could nest and propagate.

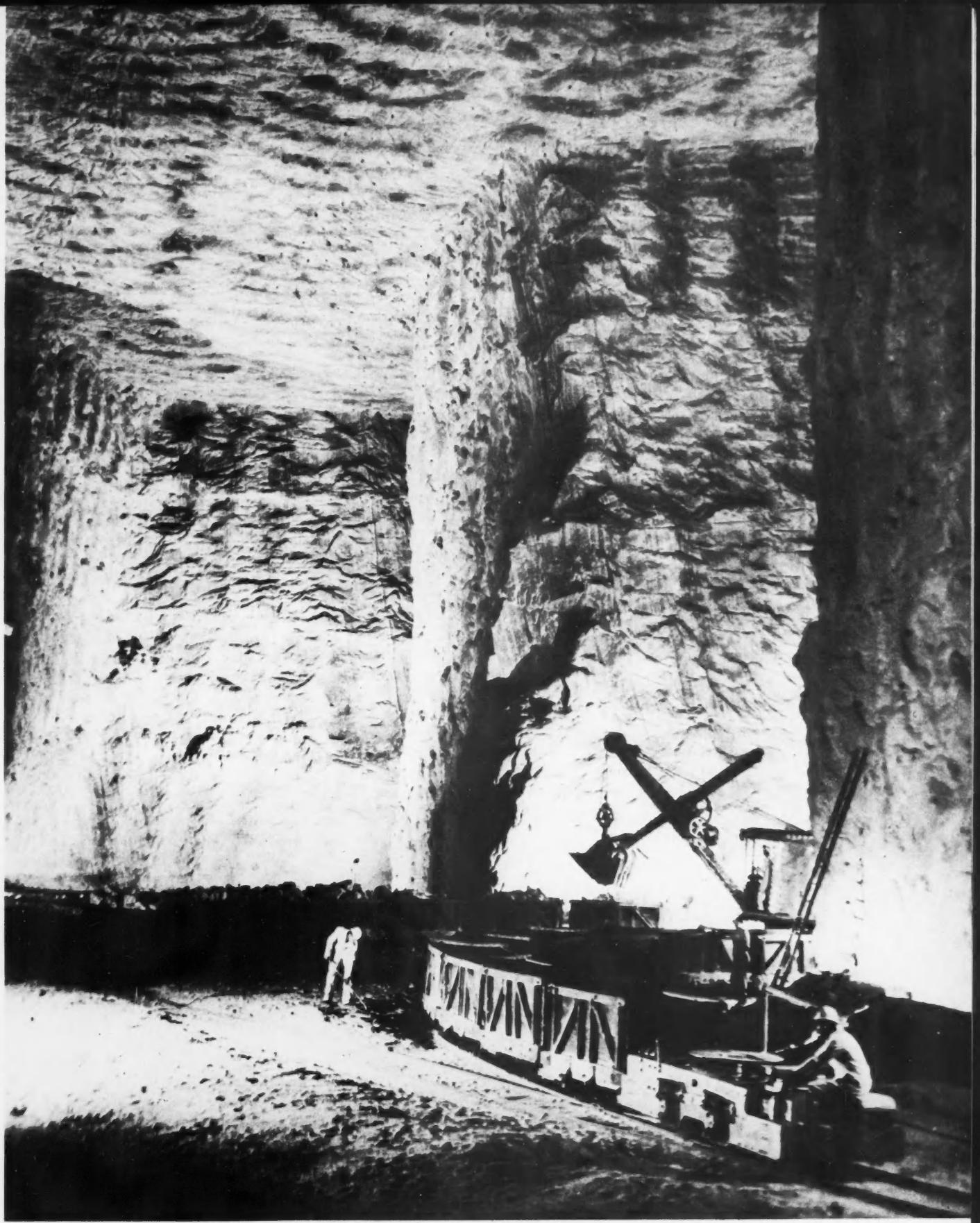
On the basis of a story told him by a British viceroy who visited him on the island, Mr. McIlhenny set about to prepare the bird haven. The viceroy's tale was about an Indian rajah who many years ago had built bamboo cages to house exotic birds from all over the world for the pleasure of a girl queen. Upon the rajah's death the unattended caged rotted and fell away, but the birds remained. Acting on that cue, Mr. McIlhenny personally combed the swamps, captured seven snowy egrets, and placed them in bamboo cages. He tended them carefully and made every effort to befriend them. At the beginning of the next migration season he opened the cages and gave them their freedom. But the birds remained. After several days, however, their natural urge moved them and they took wing, probably toward South America where egrets spend the winter.

Bird City Becomes Reality

Early the next spring Mr. McIlhenny was elated to find that two pairs had returned and had brought their young with them. This was repeated each spring until within a few years he found his plumed friends gathering in such number that he set about to prepare for them a real home on the island. That was when Bird City became a reality. Begun modestly as a small artificial lake fringed by buttonwood bushes, it has been expanded to where it now covers 35 acres. Long double-decked bamboo structures have been built out into the lake to afford adequate nesting space, and each year many truckloads of twigs and brush are dumped in the vicinity to supply the birds with ample nest-building material. Bird City's growth has been phenomenal. The birds are now protected by law in Louisiana and may nest anywhere in comparative safety. In spite of this, Bird City's population seems to increase each year; estimates in recent years have placed the population as high as 100,000 during the nesting season.

Surrounded by these chattering white birds; by a botanical profusion, personally accumulated and patterned around himself as a blossoming memorial of the far reaches of the earth where he has roamed; by the pungent odor of his world famous Tabasco sauce; and by the busy hum of a salt mine and an oil field, Edward Avery McIlhenny strides into the evening of life like a true naturalist, looking out contentedly upon the near-miracle he has wrought on the once isolated salt plug in the marshes. Not that he feels for a moment that his entire dream has been realized. In his wisdom he has made provisions for the future. Plans have been made that will add to the island's beauty and will insure for several generations the pleasure of visiting the garden spot.

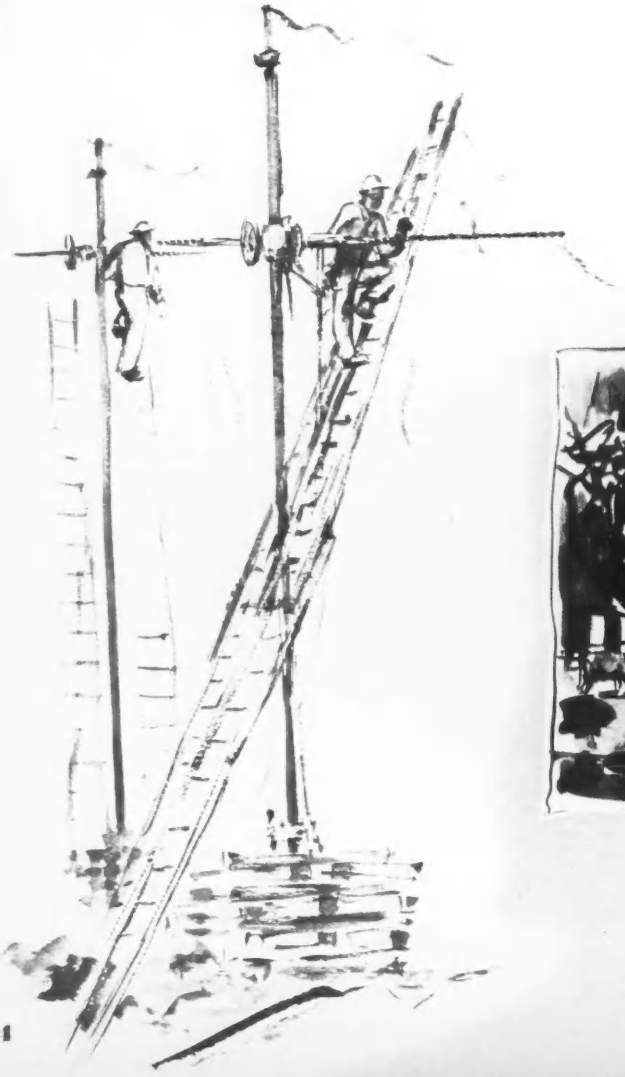
Avery Island, the domain of salt and pepper and oil, of birds and flowers, has been called by writers who have sought to describe it by such titles as, *The Garden of Eden, The Isle of Spice,* and others. To that list it seems altogether appropriate to add one more—*Wonder Island.*



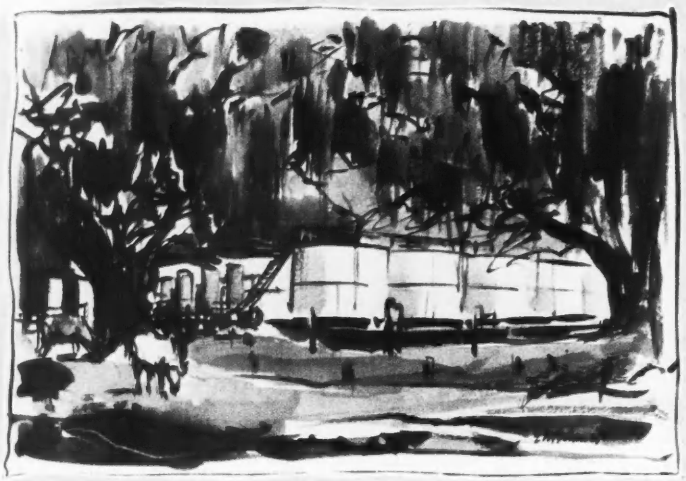
HUGE PILLARS OF SALT which support the roof of this salt mine at Avery Island measure more than sixty feet high above the floor of the mine. Thickness of the salt deposit makes unusually high chambers and corridors possible.

Pages from an Avery Island Sketch Book

EARLY EVENING at Willow Pond is a magnificent thing: the frame of graceful willows, the watery foreground of American Lotus flowers, and on the other side the fine oaks, many evergreens, and wisteria vines — a perfect backdrop for bamboo built Bird City. At this time the birds moved in, thousands of them—blue herons, white egrets, ibis, ducks, geese, and the small outsiders like tanagers, blue jays, and wrens.



AT ONE END of the island we found this tank battery with a different wardrobe. Here were all the ingredients for a fine pastoral painting — blue skies, heavy bearded, finely structured oaks, lazy animal life, nice earth color. This subject was greatly enhanced by the clean silvery surfaces and the strong pattern of the battery. This was a beauty to put down.



WE COURSED many miles of these man made waterways until we came upon this operation. The skies were grey and soggy and the blues of the derrick machinery and the yellow golden rod along the banks carried beautifully with the grey. All along the canal numerous Christmas trees pronged out and added a fine pattern.

THE VIEW OF this field of Tabasco peppers made you think of thousands of midget Christmas trees heavily festooned with green. yellow and red tapered lights. The day was warm and the air was saturated with a delightful pungent odor from ripe peppers. Right in back of us stood an old granary and all around it and on it, hundreds of buzzards were taking in the sun with spread wings.

TORRENT OF BICYCLES comes flooding out of Baytown refinery at shift time, when throaty blasts on the boilerhouse whistle send hundreds of employees toward the two main gates. More than 2000 bikes carry Baytown people to and from work.

Bicycles Built for Two

THOUSAND

THE Tri-Cities schoolboy who has any real ambition to own a bicycle usually manages to get one of his own, for he knows that he is not likely to fall heir to "the one Dad used to ride." Dad is still riding it. Not that this indicates arrested development on the pater's part; he emerged long ago from the "Look, no hands!" age. It's just that he needs his bike in his business.

The reason for such prodigious pedalling in this East Harris County community is that most Dads in Baytown, Goose Creek, and Pelly work at Humble's 2600-acre Baytown refinery. Some of the plant units are a mile or more from the front gates, and two or three miles a day hardly comes under the classification of a casual stroll.

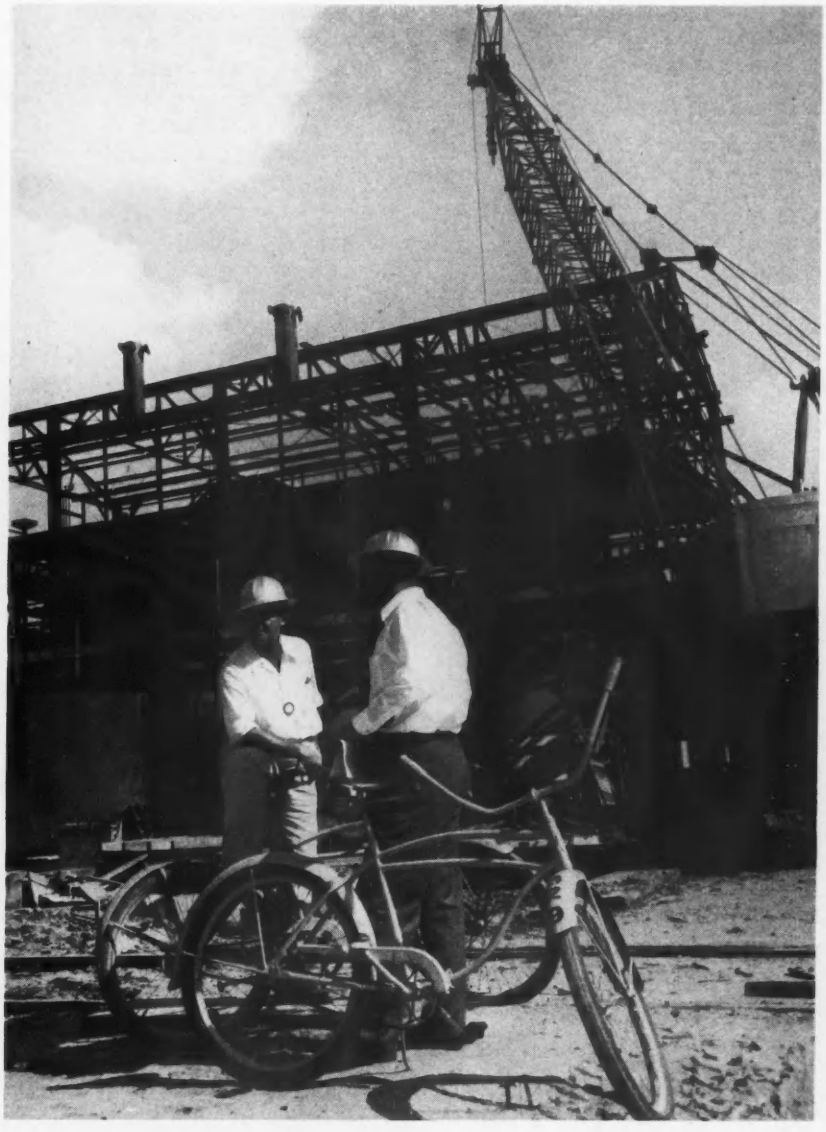
To save time and energy, about 2000 employees ride their own bicycles to and from work, and the Company issues about 500 more to key men and supervisors. That puts roughly half of the refinery employees in a bicycle saddle at least twice a day. Some, who come by automobile as far as the refinery gate, park their bikes in racks provided for that purpose near the clockhouse and ride them only inside the plant. Others leave the family car at home and go all the way by bicycle.

Privately owned bikes must pass a safety inspection before owners may ride them inside the refinery, and each bears a license plate issued by the Plant Protection Department. Those owned by the Company, painted a brilliant yellow, are sometimes irreverently referred to as "bananas." These are repaired and maintained at a bicycle shop inside the refinery. Ridden by supervisors or by mechanics carrying small repair parts from one job to another, these Company bikes shuttle back and forth across the refinery day and night. Those with large baskets in front may be used to carry materials or tools into areas where the danger of explosive vapors prohibits entry of trucks or automobiles.

There is considerable automotive equipment operating within the refinery, of course, and bicycle riders must be familiar with safety and traffic rules to avoid conflict with the normal and necessary flow of transportation. Lanes marked for "Autos," "Bicycles," and "Pedestrians" have been set up on all main-traveled roads. Bicycles operating within the plant at night are required to carry an explosion-proof flashlight mounted on front.

Sometimes it seems that everybody rides a bicycle at Baytown. Throaty blasts from the boilerhouse whistle at shift time send wave after wave of bicycles surging toward the two main gates. It is an evacuation rapid and orderly enough to please the heart of the most exacting military strategist.

COMPANY BICYCLES flash across the refinery's 2,600 acres day and night as supervisors, engineers, inspectors, mechanical repairmen and others shuttle back and forth between jobs. Here a design engineer and a field supervisor are discussing progress on new construction work.



PRODUCTION:

*Basis for Prosperity**

WE ARE confronted by an increasing number of complex economic problems as individuals and as a nation. To meet those problems squarely and deal with them correctly, it is necessary that we understand certain basic economic realities, for the decisions we make today are of profound importance for many future years.

Understanding the economic problems which we face daily requires analysis of the productive activities of mankind. Production consists of making goods and rendering services that satisfy some human want. Production, in short, creates income and wealth. Since production and income are so inseparably linked, the wealth of a nation and of its individual citizens makes a good starting point for any discussion of economics.

PRODUCTION is the basic economic reality. An increase in production adds to the wealth of the nation. When we do anything to restrict production, we are reducing the flow of goods and services that satisfy our needs and desires. That concept seems and is very simple, but we often fail to keep it in mind when considering economic problems.

A few examples will serve to show that our thinking is not always straight about this simple relationship between production and income which is the basis of wealth. Some of the practices of labor obviously flaunt the principle that production is the desirable economic goal because they restrict output by arbitrary standards as to the amount of work to be done in a day or the number of men required for certain activities. Regulations requiring, for example, that musicians and electricians be engaged in cases where they are not needed or used result in a loss of production, since idle men do not create goods or services that anyone can enjoy. Such practices reflect the mistaken idea that employment is our economic goal, rather than production. Employment that is not productive does not create income or wealth, even though the men may be well paid in money wages.

It is not mere employment that we are seeking, nor full employment. Full employment for every able-bodied person can be created at any time by having one group of people dig holes and another group to follow after and fill up the holes. We can all see the fallacy of "full employment" in this extreme case, but we should also recognize the error in any artificial work that does not result in maximum production. It is a high level of production that we want. Our goal should be more production with less effort and shorter hours. It is fine that the American people, working forty hours a week, can produce far more now than they could fifty years ago when they worked seventy to eighty hours a week. Perhaps ultimately we will achieve the ideal of full production with very little human effort, so that everyone can spend more time enjoying life than in making a living!

Men, Machines, Management Needed

Assuming that we accept and understand the relationship between production and wealth, the important question becomes: "How can we increase production?" There are three factors involved in production. *They are men, machines, and management.* Natural resources are necessary, too, but natural resources lie completely idle until man comes along, discovers how to use them, and produces them. It always takes some effort on the part of man to convert a natural resource into useful wealth. The basic productive resource, therefore, is man. Unfortunately, there seems to be a tendency to lose sight of the fact that production depends on how much we actually do through individual and collective efforts. We can make work easier by the use of machinery, by inventing new techniques, and by better organization; but the real income and wealth of a nation depends on the productive efforts of men and women. The more we produce individually and collectively, the more wealth we have and the the better off we will be.

Machines actually represent labor and materials translated into objects that multiply or facilitate human effort. Take shoes, for example. Long ago, a cobbler worked many hours to make a pair of shoes. Today, a few workers can turn out shoes by the hundreds with the aid of machinery. Production and wealth are increased by such devices. The fear of machines as a cause of unemployment is based on incorrect thinking about the way our economic system works. Machines are productive, and therefore good; they help us do more, do it easier, and do it cheaper. Therefore, more of us can have the good things of life and more of us have an easier job.

Management is a specialized activity of men in planning ways to produce goods efficiently and intelligently. Each task we do involves some planning. Even small chores around the house can be completed much more easily and quick-

MACHINES help us produce more goods at less cost and effort. They raise living standards.

* From an address on "Understanding Economic Realities," delivered by Dr. R. J. Gonzalez, Economist, before Baytown refinery supervisors on June 5, 1947.

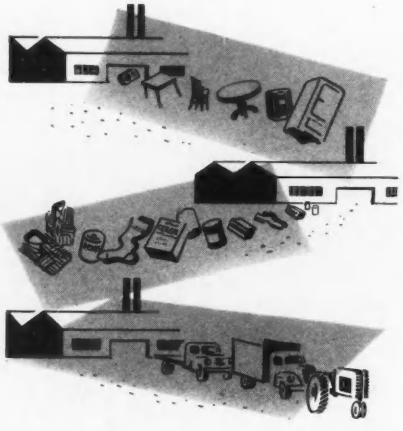
ly by studying the tools to be used and the methods of using them. We use management in our own lives, and in our own families. It is most important in the case of production on a large scale. The advantages of good management in carrying out complex and extensive operations are tremendous, to the great benefit of society through increased production.

The way we combine and use men, machines, and management determines the *amount* of production, or wealth, that we create. Two modern developments, however, have made economic problems more complicated and difficult to understand than they used to be: (1) specialization, and (2) money.

No Magic Road to "Something for Nothing"

A century ago, a man could very well see the relation between his effort and his production because most men were engaged in agriculture or in simple handicraft occupations. The cobbler could tell whether he had made two pairs of shoes a day or four, and he knew what those shoes were worth in terms of other commodities. The farmer knew that if he did not work as hard, he did not produce as much, weather being the same. Today, specialization of tasks makes it hard for a man to trace the relationship between his effort and his production. Nevertheless, the same basic economic laws which were working a century ago are still working today.

How much we produce depends directly on how much work we do. It is not easy for people to see that relationship, however, in our complex economic system. Consequently, we are inclined to feel, increasingly, that production will not be affected if we ease up individually. That, of course, is bad. That sort of philosophy is contagious. It is obvious that if everyone reduces his efforts, total production will fall off, and all of us will suffer. There is no magic road to perpetual motion in economics any more than there is in physics. Everyone must bear his share of the load, or we will all suffer the penalty of reduced production.



PRODUCTION is the basic economic reality. Any increase adds to the national wealth.

Perhaps the most confusing concept of all, the one that really turns our economic thinking topsy-turvey, is money. We have come to think of money as wealth, because that is the common measure of value. That, of course, is wrong; money is only a medium of exchange. A dollar today is not the same thing as a dollar was in 1933, as anyone who has bought commodities then and now can testify. The fact that an article may sell for five dollars today and ten dollars tomorrow does not increase the real wealth involved in that article. Yet popular thinking generally confuses higher money wages and prices with increased wealth. That false concept forms the basis of many "quack" economic remedies.

There have been many schemes proposed to increase the national wealth by increasing the amount of money in circulation. Every once in a while, a new plan gains popular attention. When we hear of such schemes, we should ask ourselves the basic question: "Will production be increased by the plan?" If the answer is negative, the scheme has no merit. If such a plan will increase production, then it is good, and we should support it. Unfortunately, many of us fall for such schemes because we like to think we can get something for nothing. It is rather hard to concede that some fascinating scheme for making everyone rich simply cannot live up to its glittering promises. The fallacy in such proposals can usually be brought out by carrying them to an extreme. If "Thirty Dollars every Thursday" will mean prosperity, then $30 every day should be even better! If pensions for everyone over 65 will solve our economic ills, pensions for everyone over 25 years should be even more wonderful! We can see the error of such fantastic promises. We must be equally alert against more subtle schemes that rest on the same basic fallacy of "Something for Nothing."

Dividing the Income from Production

Now let us consider the distribution of the production between the various factors. What should be the share of men, machines, and management for their contributions to production? With any given quantity of production, one group may gain at the expense of the others, without working harder, just by securing a bigger slice of the available pie. That means that somebody else has less, since production remains the same. The other way by which all of us can enjoy more income is to produce more, so that the same share will leave everyone better off than before.

There has been a tendency in recent years to think that these shares in production are very flexible, subject to drastic change without destroying the incentive to produce on the part of the other factors involved. This view fails to recognize another basic economic reality. We are willing to work hard only if we feel that we are getting a fair share out of the resulting production. The effect of a larger share for men or machines must be studied in the light of the probable influence on the group that will receive a smaller share. At the end of the war, many government economists said that wages could be raised fifteen per cent without raising prices. That opinion proved to be wrong because production was not sufficient to justify higher pay.

Many people think wages can be raised at the expense of profits because they think profits are very large. Surveys show that 40 per cent of the people believe that industrial profits average 40 per cent. Actually, it is an exceptionally good year when American industry, in the aggregate, earns eight per cent on its investment. People consider 10 per cent a fair return on invested funds, but stockholders generally realize much less than that.

Surveys also show that most people think that stockholders and management are paid too much and the wage earner too little. Actually, the great bulk of the income of American business goes to employees in wages and salaries. Capital and management generally receive only a moderate return. Yet, to supply the goods needed, the return to capital and management must be adequate to draw the necessary funds and men into each field. The efficient operators naturally are going to make more than the average. That is the stimulus which makes the system work. Without it, the incentive for production is destroyed. The same thing is true in agriculture; efficient operators make fairly

MONEY *is not* wealth, but a medium of exchange. The money value of an article may change without changing its real value at all.

NO MAGIC ROAD will lead us to "something for nothing." We must be on the alert against subtle schemes founded on that basic fallacy.

substantial profits while inefficient ones do not.

Wages are the price paid for the productive efforts of men. If wages rise out of line with what men are really worth, people either cannot afford to buy the goods, or they are going to find a cheaper way to make them by using more capital and less labor. It was strange indeed during the depression to have the government attempting to increase employment and at the same time driving wages up so fast that it paid business to substitute machines for men. Whenever the prices for men and machines are forced out of proper balance, efficient management will seek to change the relative amounts of each used in order to turn out goods at a reasonable cost. We should not overlook the fact that consumers do not have to pay the price that labor asks. Sometimes they have no choice for a short time, when demand greatly exceeds supply, but such situations do not last long. If people have to pay excessive amounts for some commodities, they have that much less for others. Excesses in the field of economics, as in other human activities, carry with them inevitable penalties.

The Danger of a Planned Economy

In recent years, the idea of economic planning by the state has been vigorously advanced as the solution to all problems. After all, it is said, if planning is good in large organizations, why not apply it to all the economic activity of a nation. The answer is apparent to all who realize that a major limitation in large companies is the difficulty of managing operations correctly and efficiently. The difficulties would be multiplied enormously in centralized planning of all economic activity. Planning on a national scale for any industry would lead to terrifically expensive mistakes. Mistakes in planning by a private business are paid for by stockholders. If we make too many mistakes, we are soon out of business and somebody else is doing our job. That is the control which works in a competitive system through the relation of costs and prices.

Government planning and control would destroy competition and sweep away the advantages of the price system. Mistakes in planning, which are inevitable, would be paid for through taxes, and consumers would not have the alternate source of supplies at lower cost by efficient operators that they enjoy under competitive enterprise.

Planning carries with it the concept of telling people what to do. Our system has a lot of defects, but with all its defects, it has still proved to be the most productive and the only one that can give us freedom. Economic freedom is perhaps inseparably linked to political freedom. Under our system, we may choose the work we want to do and the goods we want to buy. Every day we cast many ballots for and against many companies by the purchases we make. The companies that do not receive enough favorable votes are soon out of business.

The Basis of Big Business

An important aspect of our modern economy is the role of large scale organizations. All of us have heard many vigorous attacks on monopoly and "big business." Some of these attacks probably are warranted, but others are not. It is not a question of whether a business is big, but of whether it is productive and efficient in the work it undertakes to perform for society. Big business has its economic foundation in the character of modern enterprise. It takes a large capital, invested in plants and machines, to carry on many of our modern industrial activities. You cannot have a refinery running a barrel of oil a day, or a steel mill that makes only a ton of steel, or an automobile plant that makes only one automobile a day. Big business has shown its value in being able to organize men and machines for efficient, low cost production. It must stand or fall on that ability. If it ceases to be efficient, let competition come in and take away its market. If it becomes monopolistic, then the government has to intervene to protect consumers. But so long as big business produces and distributes goods efficiently, it is serving the people well.

One thing we must guard against is the constant effort on the part of inefficient business to protect itself by legislation. Agriculture has put pressure on Congress for years for subsidies. The

GOVERNMENT CONTROL is no solution to the problems of private industry. It would multiply those problems and make them more difficult.

COMPETITION AND the price system, operating in an economy of free enterprise, benefit consumers most; insure more goods at less cost.

results of that pressure are evident in present high prices for farm products and foods. Small business sometimes seeks legislation to protect its position. Such legislation is not justified if it seeks to prevent more efficient concerns from passing on to consumers the benefits of lower costs. Remember, the test for all the innumerable proposals for economic legislation is whether they serve to increase production and provide goods at low cost.

Henry Ford, Thomas Edison, and others created large businesses and made fortunes because they found ways to produce things that mankind wanted, and ways to manufacture them cheaply enough so that many people could buy their products. There is no reason to criticize the accumulation of private fortunes when that is done by contributing so much to our income, wealth and happiness. Any system that would discourage another Henry Ford from making a real contribution to the economic wealth of this nation would be a poor economic system, indeed.

The Role of Government in Economics

Our concept of the role of government in the national economy has changed a great deal since the days of Thomas Jefferson, and properly so in many cases. Few people, for example, would seriously question the wisdom of having the government provide public education. There are other activities which government has undertaken, however, about which many of us still have grave doubts. During the depression of the thirties the government undertook many projects of questionable nature, some of which have been continued long beyond the end of the emergency which led to their creation.

The idea gained prevalence during the depression that government could set aside economic laws and conduct its activities without regard to sound economics. This idea was fostered by the ability of the government to spend more than its income, by borrowing money, so that it seemed money could be distributed without collecting it back in taxes. We should remember that the people will have to pay the bill for whatever the government spends, and that the bill is increased, not cancelled, by deferring payment to a later date through borrowing. If distribution of government funds is carried out in such manner as to reduce production, we suffer a loss of income as well as higher taxes.

Federal, state, and local governments in this country now spend forty to fifty billions a year, or twenty-five per cent of all of the income of the people of the United States. In other words, one-fourth of our work is required to support the activity of the government. In return, the government provides fire protection, police, schools, military establishments, and other necessary services, but it also does some things which are not so clearly essential or desirable. These activities and expenditures should be judged on the basis of the value received by the people for the cost involved. Unfortunately, many such activities restrict production and reduce wealth. Those policies are too expensive to support.

The Penalty of Economic Ignorance

The basic economic reality is production, which represents the combined efforts of men, machines, and management. We organize productive efforts in our system by a competitive method. We allow the people to compete with each other in an attempt to satisfy wants more effectively. The system is not only productive, but also allows a maximum of freedom. We know our system is not perfect, but we have not yet been able to devise a better one. We want to improve this system, but in trying to improve it, we must be sure not to destroy its benefits. When you study any economic system, weigh the advantages and disadvantages and then strike a balance to see whether you like it or not. In these days, it is imperative that we try to gain a better understanding of economic realities; that we use the three production factors of men, machines, and management in the best and most efficient manner. *Remember that the penalty for economic ignorance is the destruction of income and wealth.*

QUIET PASTURES

Field Tests Show Humble D.D.T. Concentrate Controls Livestock Pests Effectively and Safely

IN AGRICULTURE, as in every phase of American life, the oil industry plays an important role. It provides the fuels and lubricants to operate the farmer's mechanized equipment, kerosene for his brooders, liquid gas to heat his home and cook his meals, rust preventives to protect his machines against corrosion, and numerous other products that make the farmer's life more pleasant and his work more profitable.

Now, the oil industry has made another important contribution to agriculture and the cattle industry. It has developed a new insecticide for use on livestock; an insecticide so effective that it is saving Southwestern cattlemen hundreds of thousands of dollars worth of beef losses each year. The product is a liquid concentrate of D. D. T., the war-born "miracle insecticide" which made the insect-ridden jungles of the South Pacific islands habitable for our military forces.

Exciting News for Cattlemen

When stories of the amazing effectiveness of D. D. T. trickled back from the Pacific islands, it was exciting news for the cattle industry. Insects which pester animals have always been a major problem to livestock raisers. Cattle lose valuable weight when biting insects prevent them from grazing peacefully. Dipping or spraying the animals with the usual insecticides gives temporary relief, but the effects wear off in a few hours and the swarms of pests return. Experience of the military, however, had demonstrated that, the effectiveness of D. D. T. continued for weeks. The question was, what effects would the use of D. D. T. have on animals?

The answer to this question was found during the summer of 1945, when large scale tests were conducted on herds of livestock in Kansas. The experiments were official; they were conducted by the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture, the Kansas State College Extension Service, the National Livestock Loss Prevention Board, Southwestern Region, and the Kansas State Livestock Sanitary Commissioner.

Results of the tests were electrifying. It was found that D. D. T. when properly applied to cattle in dipping vats or with sprayers, completely controlled horn flies, mosquitoes, lice and most flat ticks for two to four weeks after each application. Cattle protected with D. D. T. in the experiments gained an average of fifty pounds per animal over untreated animals during the 90-day insect season. And D. D. T. had no ill effects whatever on the animals.

Special preparations were necessary because crude D. D. T. is a white, flourlike powder. It cannot be used effectively on livestock until a carrying agent

CATTLE GRAZE peacefully and grow fat if they are not constantly disturbed by flies, mosquitoes, and other biting insects. Against these, Humble DDT Concentrate has proved effective.

is added. Water is the cheapest carrying agent, but crude D. D. T. will not dissolve in water, unless special ingredients are added to form a wettable powder. Certain aromatic solvents, however, will dissolve large amounts of D. D. T., and with emulsifying agents added, a liquid D. D. T. concentrate is formed which can be readily mixed with water to give the proper strength for use on livestock.

In the carefully controlled Kansas experiments, both forms of D. D. T. preparations were tested—the wettable powder; and an emulsion of D. D. T. dissolved in xylol.

Scientists of Humble Oil & Refining Company, realizing the importance of the Kansas tests to the livestock industry of the Southwest, carefully followed the progress of the experiments. Even before the final results of the tests were officially announced, Humble technicians at the Baytown Research Laboratories, cooperating with the Special Products Division Laboratory and Sales Technical Services, were well on the way to perfecting an improved D. D. T. Concentrate.

Concentrate Easy to Mix

They chose to develop a concentrate form of D. D. T. rather than a wettable powder, because a careful study of ranchers' needs showed that the liquid concentrate would offer several important advantages. It would be convenient to handle and easy to mix with water; it would work equally well in dipping vat or spraying equipment, and it would not clog sprayer nozzles.

The Humble technicians knew they could make three types of D. D. T. concentrates with the materials available. The problem was to determine which of the three would be best for ranchers' use.

One type makes a completely stable emulsion when mixed with water. It does not separate from the water when allowed to stand without agitation. If a rancher's dipping vat were charged with this type of concentrate, and rains caused the vat to overflow, valuable D. D. T. would be wasted.

A second type of concentrate, when mixed with water and allowed to stand without agitation, forms a not so stable emulsion. The D. D. T. and solvent separate as a cream from the water and rise to the surface. There would always be the danger that an animal might come in contact with the strong concentrate floating on the surface of the dipping vat and thus receive an injury to its skin. This type would also have the disadvantage of losing valuable D. D. T. every time rains overflowed the vat.

The third type of concentrate has none of the faults of the other two. It forms an unstable emulsion, and the D. D. T. and concentrate separate from the water as a cream. But instead of rising to the surface, this cream settles to the bottom of the vat, where it remains protected against overflows and evaporation. Animals cannot come in contact with it, because of the protecting blanket of water. Yet it requires but little agitation to cause it again to mix uniformly with the water in the vat. This was the type of D. D. T. concentrate developed by the Humble technicians.

Toluene Evaporates Faster

In the Kansas experiments, U. S. D. A. scientists had tested a 25% D. D. T. concentrate, using xylol as the solvent. Humble increased the D. D. T. content to 35%, and substituted toluene for xylol as the solvent, because toluene evaporates faster. The sole purpose of the solvent is to place the D. D. T. in contact with the animals' skin; then the faster it evaporates, the better.

By the fall of 1945 the new product, named simply Humble 35% D. D. T. Concentrate, was ready for field tests. Insects were exceptionally bad in Brazoria county at that time, and cattle herds were suffering severe weight losses

BRAHMAN STEERS can be difficult to manage when they are covered with horn flies like this. After passing through the chute and into the dipping vat this animal will be protected for weeks.

because of the pests. A prominent Brazoria county rancher, T. J. Poole, Jr., volunteered his herds and dipping vats for a demonstration of the new product. Ranchers of the area watched the results with interest.

The demonstration was an outstanding success. Mr. Poole reported, in part, that the original 2177 head of cattle dipped on November 3 were checked on December 5 and found to be free of flies of any kind. They were dipped again on that date, and were checked again late in January. They were still free of flies, and were not bothered by the swarms of mosquitoes which heavily infested the area.

Marketed Early in 1946

While several additional demonstrations were being conducted during the fall and winter of 1945-46, production of the D. D. T. concentrate was started at Humble's Special Products Manufacturing Division in Houston, and at the Dallas Solvent Plant. In March, 1946, the product was put on the market through bulk agencies, and was announced in advertisements to farmers and ranchers of Texas.

Every container of Humble 35% D. D. T. Concentrate bore a label containing complete and specific instructions for proper use of the product. These directions were carefully prepared and were clearly worded. There could be no misunderstanding about how to use it.

Unfortunately, some other commercial D. D. T. products had been placed on the market with inaccurate label information, and before the products themselves had been thoroughly tested. In some instances, cattle were injured or killed by improper use of these products. As reports of these incidents spread through the cattle country, ranchers began to mistrust D. D. T. concentrates in general.

To overcome this prejudice, the Humble company took a bold step. In August, 1946, it announced an unprecedented warranty, guaranteeing that Humble 35% D. D. T. Concentrate is non-injurious to livestock when used according to directions printed on the label. This warranty was placed on each label, and the action was announced in advertisements appearing in farm and ranch magazines. At the same time, widespread demonstrations were held throughout Texas, proving conclusively that the Humble concentrate is completely safe, and at the same time, thoroughly effective. This educational program continues, and has succeeded in removing virtually all the prejudices against the product.

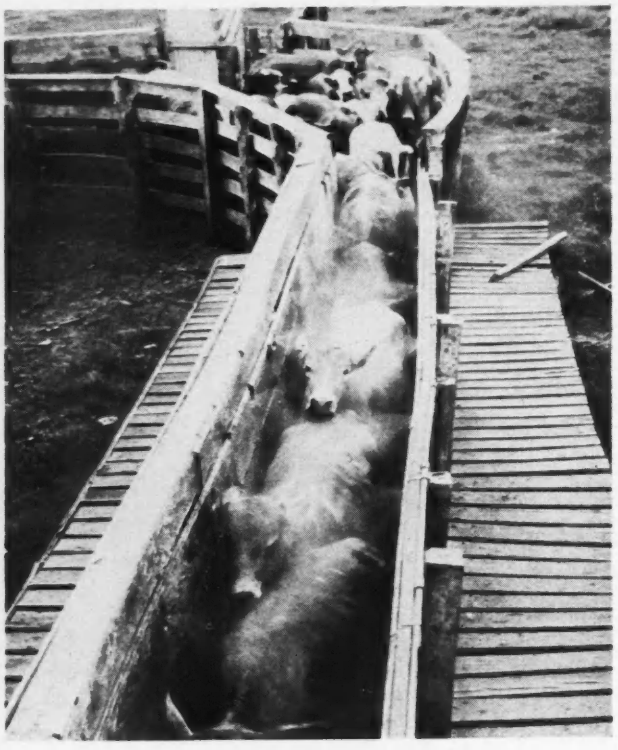
During the past summer, the same group of official agencies which conducted the original Kansas tests, with the cooperation of several commercial manufacturers of insecticides, conducted another large scale experiment on horn flies in Kansas and Missouri. Playing a prominent part in this, as in the original Kansas test, was Dr. E. W. Laake of the U. S. D. A. Bureau of Entomology and Plant Quarantine, Division Affecting Man and Animals.

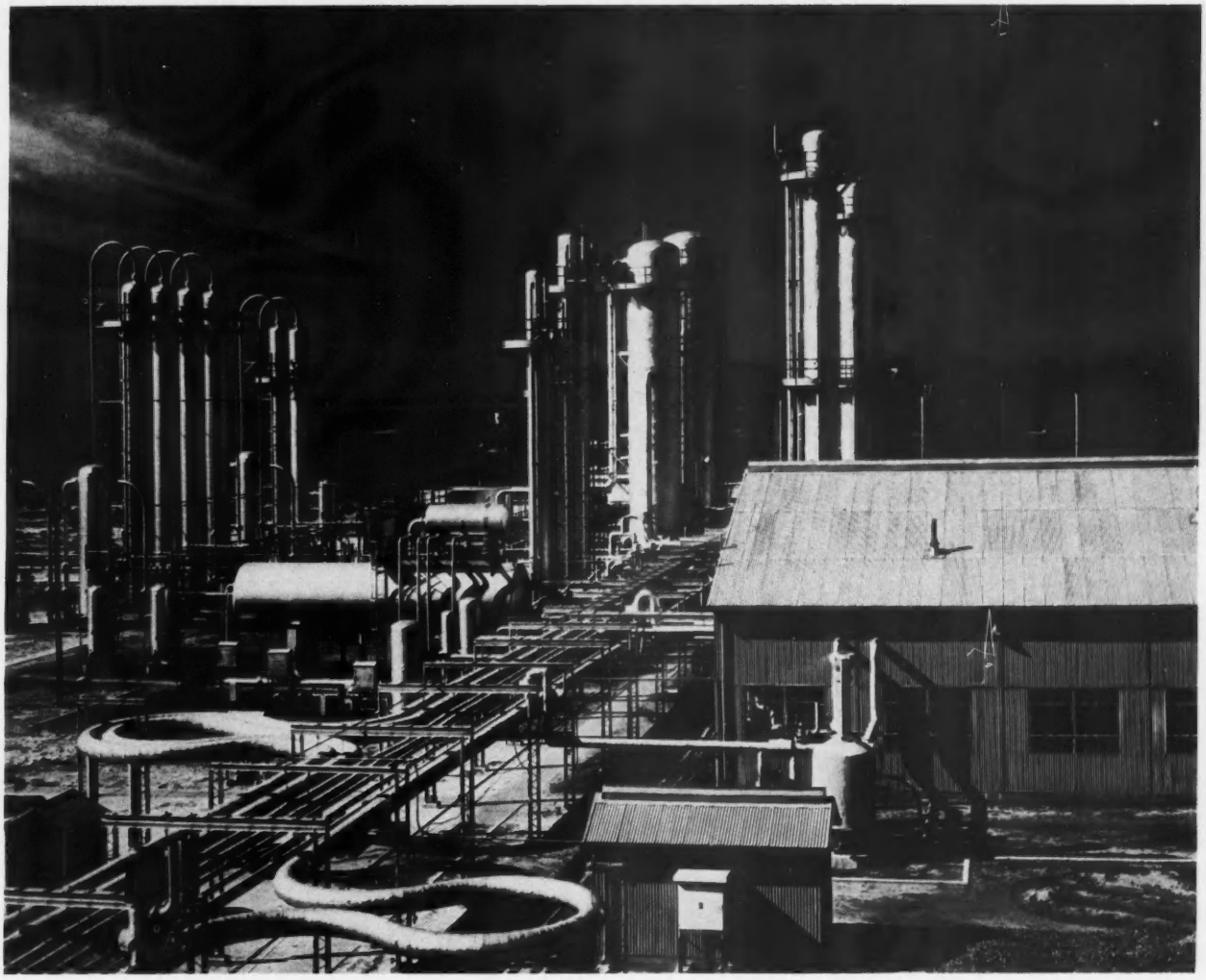
Standard for Emulsion Tests

Among the insecticides used in this year's tests were D. D. T. emulsions, D. D. T. wettable powders, and new chemicals, including D. D. T. and toxaphene. Significantly, Humble 35% D. D. T. Concentrate was the standard used for the emulsion tests.

Official results of the tests will not be made public until early in 1948, but observers report that the experiment convincingly demonstrated the safety of the emulsion type of D. D. T. Concentrate, and conclusively proved that it is unsurpassed for long-lasting effectiveness.

HUMBLE DDT CONCENTRATE IS EFFECTIVE AGAINST BOTHERSOME INSECTS; MAY BE APPLIED BY DIPPING OR BY SPRAYING





PRODUCTION RECORD OF KATY CYCLING PLANT SHOWS HOW POOLING CAN BE PUT TO GOOD USE IN GAS FIELDS

POOLING

Works in Gas Fields; Would Increase Total Recovery from Oil Fields.

ACCORDING to the changeless laws of Nature, that which is protected least will be destroyed first. In the light of this stern logic, it is more than passing strange that this nation has already squandered so much of its natural wealth in prodigal fashion.

In some cases, the binge is already over and only the headache remains. Senseless slaughter of an earlier time decimated, and in some instances completely destroyed, stocks of wild game. The last passenger pigeon died 33 years ago in a Cincinnati zoo; the prairie chicken is virtually a museum piece; the buffalo has been saved only in token herds. Special protection had to be given the snowy egret, once slaughtered wholesale for its plumage.

This wasteful orgy has not been confined to the animal kingdom. Man's improvidence has laid a heavy hand on other resources even more vital to our national life, and some of these continue to go down the drain at an alarming rate. Forest fires lay waste to our best timberlands. Every day, tons of rich topsoil are blown away by winds or carried away by rivers to the sea.

Discouraging though it may be, it appears that Man, who has distinguished himself in so many other ways—who has raised himself above the animals by his ability to think—still stubbornly refuses to admit that nothing lasts forever! And always, when the reluctant admis-

sion finally comes, it is too late to do anything about it.

This attitude of "Let us eat, drink, and be merry; for tomorrow we die" is dangerous enough when applied to those natural resources which can be replaced or replenished, however great the cost. It would be doubly dangerous if applied to those resources which cannot be replaced at any cost, such as oil and gas. We are especially fortunate, then—more fortunate, perhaps, than most of us realize—that the period of unrestricted production and wasteful practices in the oil industry was over long ago. Most of the nation's oil and gas is now being produced under the best methods of conservation, and the industry continues to work on the problem of getting the greatest ultimate recovery from each reservoir.

Conservation, in simplest terms, may be defined as "wise use." Fundamentally, it is the story of the goose and the golden eggs. The longer you can keep the goose alive, the more eggs you get; the longer a petroleum reservoir can be kept producing, the greater the ultimate recovery will be.

Men of the oil industry have worked in close collaboration with others interested in the problem, and some ways have already been found to add extra years to the life expectancy of an oil reservoir. These methods include proper spacing and completion of wells, regulated rate of production, cycling operations in gas fields, pressure maintenance, and secondary recovery operations such as repressuring and water flooding. As a result of such wise practices, this nation had the oil it needed to win World War II.

It is extremely doubtful that there would have been enough oil to win the war if conservation had *not* been practiced in most states for years before the conflict. As evidence to support that statement, compare the contribution which Texas was able to make from its oil and gas reserves to that made by Illinois, where conservation had not been practiced. Texas was able to increase its production from an average of 1,385,000 barrels of oil per day in 1941 to a wartime peak of 2,068,000 barrels per day in 1945. Production in Illinois declined from a maximum of 405,000 barrels of oil per day in 1940 to a low of 206,000 barrels per day in 1945, and has continued to decline. Daily production in Texas is now around 2,400,000 barrels per day.

These experiences of the past, and the unusually heavy demands of the present, make it mandatory that we take advantage of all sound engineering practices to assure the maximum ultimate recovery of oil and gas from our fields and a continued reserve sufficient to meet future requirements.

Just how does each of the conservation methods mentioned earlier in this article affect total volume of production from a field? Well spacing and controlled rate of production, of course, need little explanation. The first means simply that oil and gas wells are no longer placed close together, like trees in a forest. To protect reservoir pressures and thus insure longer life for the field, producing rates are now usually regulated by state agencies. Controlled production means that a field is allowed to produce only a prescribed amount of oil per day, and no more. In Texas, for example, every field is assigned its MER; that is, a *maximum efficient rate* beyond which it cannot produce without endangering ultimate recovery.

In cycling operations, gas is produced from the gas field, then run through a plant where it is stripped of its liquids. The remaining, or dry residue, gas is returned to the producing formation through "input" wells. By returning this residue gas to the producing formation, pressure is maintained in the reservoir. Residue gas spreads out from the injection well, sweeping before it the wet gas in the reservoir toward the producing wells. Thus, not only are liquid hydrocarbons recovered from the field, but the dry gas is stored in nature's own warehouse, to be produced and utilized as markets become available.

The Katy Gas Field, near Houston, used cycling methods during the last war to produce more than 400 million cubic feet of gas per day. Wet gas at Katy was stripped of liquids which in turn were converted into approximately 375,000 gallons of 91 octane aviation gasoline per day during the war.

Pressure maintenance in oil fields is another matter. In fields where there is no effective water drive, reservoir pressures are reduced as more oil and gas are produced from the field. Production ceases when the pressure is exhausted, long before all the oil is produced. In such cases, to maintain the reservoir pressure and then to increase the oil recovery, gas produced with the oil is sent back to the reservoir by boosting its pressure and returning it through injection wells. Gas from other strata or even from other fields can be used just as

SECONDARY RECOVERY methods and pressure maintenance are resorted to as oil fields

effectively to do part or all of the pressure maintenance job.

Secondary recovery operations are frequently resorted to after the original reservoir pressure has been materially lowered or dissipated, usually after the primary recovery period has passed. Such operations are carried out by injecting either liquid or gas into the producing formation, thus recovering oil which can no longer be produced by the original reservoir energy. In some instances, water is injected into the formation. This type of secondary recovery is called *water flooding*. In other cases, gas is injected, and this is sometimes called *repressuring*.

Cycling, pressure maintenance, and secondary recovery operations are all technically sound and economically feasible in many fields. It is acknowledged that such operations will frequently increase the ultimate recovery of oil or gas from a reservoir. Testimony by petroleum engineers before legislative committees of the last Texas Legislature in connection with a permissive pooling bill, known as House Bill 67, showed that if a field-wide repressuring program were conducted in the Fullerton Field in West Texas, the ultimate production from that field would be increased by 50,000,000 barrels of oil in excess of what could be produced by continuance of present methods of operation. Proportionately good results, it may be assumed, could be obtained in many other fields.

"Why," one might ask, "would any operator hesitate to enter into a cycling

grow older. In most such fields, pooling would greatly increase the ultimate recovery of oil.

program for a gas field, or a pressure maintenance or secondary recovery program for an oil field if such programs are technically sound, economically feasible, and will increase by a considerable amount the ultimate recovery of oil and gas?"

The answer is, there is no legal reason why an operator should not enter into a cycling program in a gas field. The Legislature of this state has recognized the necessity for cooperative development and operation of separately owned properties in a gas field, and has authorized voluntary agreements for such purposes.

But, unfortunately, the same answer cannot be given with reference to pressure maintenance and secondary recovery programs for oil fields. And, unless oil fields are pooled or unitized, such programs cannot be put to their full and most effective use.

Pooling means combining the separate tracts and leases in a field or portion thereof into a unit for development and production purposes. Each royalty owner and each operator, instead of being entitled only to the production from his particular tract, would be entitled to a pro rata portion of the production of the entire unit. This arrangement has been put into effect in gas fields where cycling is carried on, and it has worked very satisfactorily.

Pooling is necessary in field-wide pressure maintenance and secondary recovery programs because:

1. To be most effective, such operations must be conducted under a program planned for the field as a whole, so that input and production wells can be located in accordance with best engineering practices and without regard to property or lease lines.
2. The injection of dry gas into a gas formation will sweep the wet gas away from the area of the injection well. In the same manner, the injection of gas into an oil stratum will sweep the oil away from the injection well. This injection will increase the ultimate recovery from the field or unit as a whole, but it may be detrimental to that portion surrounding the injection well. In order to protect the royalty owners and lessees of the tract upon which the injection well is located, they must participate in production from tracts benefitted by the operations.
3. It is also impractical, from engineering and economic standpoints, to conduct such operations on each individual tract in a field unless all such tracts are relatively large.

Oil and gas fields are seldom, if ever, owned by one individual or company. They usually underlie numerous separate tracts owned by various individuals and held under lease by different operators. Therefore, the combination or pooling of these tracts is essential to cycling, pressure maintenance, or secondary recovery programs on a field-wide basis.

The Legislature of Texas, however, has never authorized pooling of oil fields for these purposes, and most operators deem it inadvisable, in view of the anti-trust laws of this state, to enter into pooling agreements in order to put such programs into effect. The need is for enabling legislation, in the form of a permissive pooling law, which would allow operators and landowners to come together in oil fields just as they may in gas fields. Other oil producing states, including Oklahoma, Louisiana, Arkansas, Alabama, Mississippi, and Florida, have passed laws providing for permissive pooling in oil fields as well as gas fields, and some of these states have authorized their regulatory bodies in charge of oil and gas developments to *require* pooling

In Texas, House Bill 67 was submitted by its authors to the Attorney General. His opinion at the time was that the bill, if passed, would constitute a serious threat to the anti-trust law of the state. Accordingly, the bill was amended by its authors to remove the objections set forth by the Attorney General. Section 5 of the amended bill provided that the bill would be invalid rather than the anti-trust law if any court should find a conflict between the two. This time, the bill passed the Texas Senate by a vote of 20 to 6, but died in a free conference committee, due to the delaying tactics of its opponents.

It must be clearly emphasized that House Bill 67 was a *voluntary* pooling bill, and did not place authority in the Texas Railroad Commission to require anyone to pool his lands, leases, or royalty interests. It merely provided that pooling agreements, voluntarily entered into, when approved by the Railroad Commission to be in the public interest, were lawful and could be entered into without fear of violation of the anti-trust law.

The failure of the Legislature to pass this bill denies the oil operators of Texas an opportunity to increase the ultimate recovery of oil and gas from fields in this state. This is especially unfortunate, coming as it does at a time when the world needs oil as never before, and when oil is becoming harder and harder to find. It is simple logic that one of the best ways to get more oil is to produce more from reservoirs where oil is already known to exist. In the interest of public welfare, any plan by which ultimate recovery can be raised by even a few percentage points should be seized upon and used to the best possible advantage. If pooling oil fields would raise ultimate recovery on a nation-wide basis by as much as four or five percent, certainly many millions and possibly even billions of barrels of oil would be added to the nation's future supply.

The present rate of oil production in this country is in excess of 5,000,000 barrels a day. The discovery of new reserves, however, is an increasingly difficult problem. Our proven reserves must therefore be developed to their maximum. To that end, the oil industry may be expected to do everything it can to correct those conditions which may prevent the greatest ultimate recovery from known reserves. The Texas Legislature can help by passing enabling legislation making it permissible for operators and royalty owners in an entire oil field to come together in a common cause, just as they may in gas fields. Everyone concerned would benefit by such a plan, and the ultimate consumer would be assured of oil products for a relatively longer time to come.

By the way . .

Retirements

Nine more names have been added to Humble's roster of retired men and women who are enjoying much deserved rest after long years of service with the Company. WILLIAM F. THOMASON, Production department lease pumper and gauger at Gladewater, retired on September 10 . . . JOHN R. BRIGHT, oiler for Humble Pipe Line Company at Navasota, on October 2 . . . FRANK SMITH, pipe liner at Station A, October 2 . . . JOHN R. MERCER, water tender at Baytown refinery, on November 1 . . . HARRY FANESTIEL, foreman of the utilities department at Baytown refinery, on November 3 . . . EDWARD A. BURKE, pipe liner at Harbor Island, on November 11 . . . JAMES M. BARNES, Production department pumper at Sand Hills and McCamey, on November 15 . . . Miss RUTH KEASLER, senior stenographer in the Law department, Houston office, on November 21 . . . STEPHEN V. JAY, general salesman and lubrication engineer for the Sales department, Houston office, on November 30.

Transfers and Changes

Since last we went to press, the Production department has announced eight changes in its supervisory forces over the Company. Hub District chief clerk B. H. C. STOVER at Columbia, Mississippi, has been transferred to the Grand Isle District at Harvey, Louisiana, as district chief clerk . . . J. D. COLE, chief clerk of the Paradis District, Paradis, Louisiana, replaces Mr. Stover in Columbia as Hub District chief clerk . . . O. J. AUCOIN, North Crowley District chief clerk at Crowley, Louisiana, has been transferred to the Paradis District as chief clerk . . . JACK PIERCE, assistant district chief clerk for the Bayou Sale District, Franklin, Louisiana, has been transferred to the North Crowley District, Crowley, and promoted to district chief clerk . . . C. C. PYLE, assistant district chief clerk of the North Crowley District, has been transferred to the Bayou Sale District, Franklin, Louisiana, as assistant district chief clerk . . . F. G. HENRY, Hawkins District chief clerk, Hawkins, has been transferred to the North Crowley District and promoted to assistant district chief clerk . . . OLLIE CANION, general clerk, has been transferred from the Civil Engineering division, Houston office, to the Grand Isle District, Harvey, Louisiana, as assistant district chief clerk . . . G. W. JONES, assistant chief clerk, was transferred from the Houston trucking terminal to the material section of the Production Operating department, Houston.

Deaths

Death claimed three employees and four annuitants since the last *Humble Way* went to press. SIMMONS MENETTE, 50, helper at Baytown refinery, died on October 12 . . . JAMES W. FRYMIRE, 53, assistant dockmaster at Baytown refinery, died on November 7 . . . GROVER G. HEIMAN, 54, shift supervisor at Baytown refinery, died on November 8.

Annuitants who have died since last publication date are: JOSEPH E. GUYNN, 70, carpenter for the Production department at Government Wells before his retirement, died October 5 . . . EDWIN CARTER, 62, oiler at Todd Station for Humble Pipe Line Company until his name was placed on the total and permanent disability retirement list, died October 25 . . . TOLBERT A. NUGENT, 57, pipe machine helper at Ingleside refinery until his name was placed on the total and permanent disability retirement list, died November 4 . . . GEORGE COOKE, 66, Assistant Secretary and Assistant Treasurer of the Company at the time of his retirement on September 25, 1945, died at Fayetteville, Arkansas, on December 10.

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HUMBLE OIL & REFINING COMPANY

P. O. BOX 2180, HOUSTON 1, TEXAS

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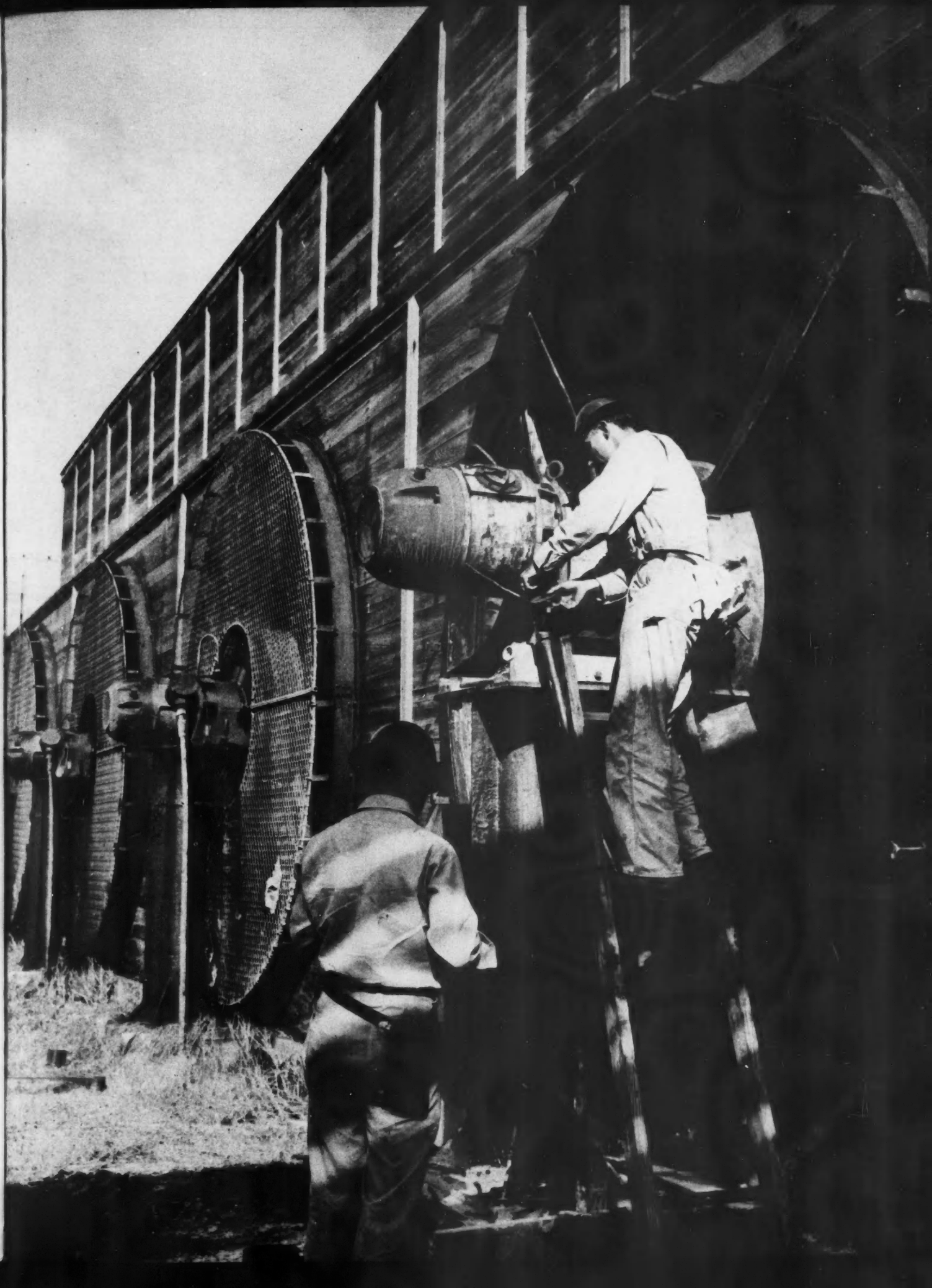
ELECTRICIANS REPAIR motor on cooling tower fan at Baytown refinery. Hot water from plant distillation units comes to tower for cooling, is then recirculated and used again.



PROGRESS *with* PETROLEUM

In an age of jet propulsion and guided missiles, with man knocking at the "wall of sound" and threatening to outspeed sound itself, it is difficult to recall a time when our own fathers were earthbound.

The "one hoss shay" and the 20-mule-team wagon were wonderful enough in their day, but they carried man and his worldly goods from one place to another at only a snail's pace by comparison with modern transportation.

Today's gasolines and lubricants and the high compression engine have given us the wings of eagles. Distance and time are no longer obstacles in the way of trade and travel. Progress with petroleum has helped to bring remote parts of the world close together, making possible a free and fast interchange of goods and ideas in our economic and social life.